

# Evaluate Status of Pacific Lamprey in the Clearwater River Drainage, Idaho

**Annual Report  
2003**



This Document should be cited as follows:

*Cochnauer, Tim, Christopher Claire, "Evaluate Status of Pacific Lamprey in the Clearwater River Drainage, Idaho", 2003 Annual Report, Project No. 200002800, 51 electronic pages, (BPA Report DOE/BP-00004039-4)*

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Portland, OR 97208

This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views in this report are the author's and do not necessarily represent the views of BPA.

# **EVALUATE STATUS OF PACIFIC LAMPREY IN THE CLEARWATER RIVER DRAINAGE, IDAHO**

## **ANNUAL REPORT 2003**

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Project Number 2000-028-00  
Contract Number 00000090-00001

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## ABSTRACT

Pacific lamprey *Lampetra tridentata* is a native Snake River basin species occupying a unique ecological niche. Recent decline of Pacific lamprey adult migrants to the Snake River drainage has focused attention on the species. Adult Pacific lamprey counted passing Ice Harbor Dam fishway averaged 18,158 during 1962-69 and 545 during 1993-2003. Human natural resource manipulations in the Snake, Clearwater, and Salmon River drainages have altered ecosystem habitat in the last 120 years, likely impacting the productive potential of Pacific lamprey habitat. Timber harvest, stream impoundment, road construction, grazing, mining, and community development have dominated habitat alteration in the Clearwater River system and Snake River migratory corridor. Hydroelectric projects in the Snake River corridor impact juvenile and larval Pacific lamprey outmigrants and returning adults. Juvenile and larval Pacific lamprey outmigrants potentially pass through turbines, turbine bypass/collection systems, and over spillway structures at the four lower Snake River hydroelectric dams. Clearwater River drainage hydroelectric facilities, including the Pacific Power and Light dam on the Clearwater River in Lewiston, Idaho, (1927-1972) Dworshak Dam on the North Fork Clearwater River (1972-present), and Harpster Dam on the South Fork Clearwater River (1910-1963), severely or completely restricted chinook salmon *Oncorhynchus tshawytscha* passage and altered or obstructed passage routes of outmigrating Pacific lamprey juveniles, larvae, and upstream adult migrants.

In 2003 Idaho Department of Fish and Game continued investigation into the status of Pacific lamprey populations in Idaho's Clearwater River drainage and implemented initial foundational sampling in the Salmon River drainage. Trapping, electrofishing, and visual habitat assessment surveys were used to determine Pacific lamprey distribution, life history strategies, habitat requirements, and population abundance in the South Fork Clearwater River, Lochsa River, Selway River, Middle Fork Clearwater River, and lower Salmon River subbasins. Three-hundred forty-nine ammocoetes were captured electroshocking 63 sites in the South Fork Clearwater River, Lochsa River, Selway River, Middle Fork Clearwater River, Clearwater River, Salmon River, and their tributaries in 2003. Presence-absence survey findings in 2003 augmented by 2000-2002 surveys consistently indicate Pacific lamprey ammocoetes and macrothemia are not numerous or widely distributed. Pacific lamprey distribution was confined to the lower reaches of Red River below rkm 8.0, the South Fork Clearwater River, Lochsa River (Ginger Creek to mouth), Selway River (Bear Creek to mouth), Middle Fork Clearwater River, the Clearwater River (downstream to Potlatch River), and the mainstem Salmon River downstream of the S.F. Salmon River.



## INTRODUCTION

The Pacific lamprey *Lampetra tridentata* is facing the same migratory hazards and habitat degradation as other anadromous fish species in Idaho. Because this fish is not recognized as a sport or game fish species, little attention has been given to its status. Records documenting Pacific lamprey presence historically in Idaho are rare. Gilbert and Evermann (1894) identified the upstream distribution limit in the Snake River near Shoshone Falls. Idaho Department of Fish and Game (IDFG) personnel captured Pacific lamprey ammocoetes in the Snake River Dam anadromous fish downstream migrant traps near Brownlee Dam (Bell 1959). The Pacific Power and Light Lewiston Dam monitored Pacific lamprey adult upstream passage in the 1958-1972 period, however records were inconsistent during 1962-1972.

The ecological interaction of Snake River Pacific lamprey populations and other riverine species is thought to contribute to Snake River basin overall aquatic productivity. Pacific lamprey ammocoetes provide Snake River basin white sturgeon *Acipenser transmontanus* with an important food source which potentially contributes to population productivity (Galbreath 1979). Pacific lamprey adults are a source of marine derived nutrients in the Snake River basin. Aquatic and avian predator utilization of ammocoetes and macrothemia (Merrel 1958) potentially results in reduced predation impact to outmigrating juvenile salmon and steelhead trout *Oncorhynchus mykiss* in the lower Snake River migrational corridor. Pacific lamprey, chinook salmon *O. tshawytscha*, and summer steelhead trout, rear in Snake River basin stream habitats, however, the ecological relationship interactions of the three species in the basin are little known.

Habitat degradation in the Columbia and Snake River basins associated with mining, livestock grazing, stream channelization, logging, road construction, and urbanization in combination with hydroelectric impacts are implicated as the major factors contributing to Pacific lamprey declines (Close et al. 1995; Jackson et al. 1996; Jackson et al. 1997). Hydroelectric dam upstream passage ladders are difficult structures for Pacific lamprey upstream migrants to navigate (Vella et al. 1997).

Pacific lamprey ammocoetes (also termed as untransformed) are eyeless upon hatching and filter feed 4-7 years before undergoing transformation into macrothemia. Transformation changes include formation of an oral disc and eyes among other morphological processes. Following transformation into macrothemia, Pacific lamprey migrate to the ocean and parasitically feed on a wide range of marine aquatic organisms (Scott and Crossman 1973) for an estimated 1-2 years prior to returning to freshwater to spawn.

The Clearwater River drainage of north central Idaho is an important study area as both Pacific lamprey ammocoetes and macrothemia have been captured in S.F. Clearwater River anadromous fish smolt traps since 1992. Understanding Pacific lamprey larval fish population composition, migrational behavior, and habitat needs will provide basic information to better manage Pacific lamprey. Without this knowledge, the opportunity for preservation of critical habitat may be lost. This project continues to augment our knowledge of Pacific lamprey and provide critical information to minimize future degradation of habitat.

## PROJECT AREA

The Clearwater River drainage is located in north central Idaho and encompasses approximately 2.5 million hectares (Figure 1). The major tributaries include the Potlatch, S.F. Clearwater, N.F. Clearwater, M.F. Clearwater, Selway, and Lochsa rivers.

Hydroelectric dam construction in the Clearwater River drainage has impacted salmon, steelhead, and Pacific lamprey populations. The Pacific Power and Light Lewiston Dam, was constructed in 1927 at Clearwater River rkm 1.8. The dam was originally constructed with two upstream passage ladders, but obstructed steelhead trout passage somewhat and salmon passage severely. In the 1927-1940 period when the problem was detected and remedied, spring chinook salmon and fall chinook salmon populations were already reduced to remnant numbers and subsequently never recovered (White 1954). The impacts of the Lewiston Dam to Pacific lamprey macrothemia and ammocoete downstream migrants and upstream migrating adults are unknown, however, counts documented the presence of adult fish (Figure 2). Dworshak Dam, constructed in 1972 on the North Fork Clearwater River (rkm 1.8) was constructed without an upstream passage ladder. Anadromous fish populations upstream of the project are now considered extirpated. Harpster Dam constructed in 1910 on the S.F. Clearwater River blocked anadromous fish upstream migration in the 1949-1963 period, however, impact variables directly relating to Pacific lamprey are unknown. Steelhead trout migration was possible, although limited, over the dam from 1935 to 1949. High flows destroyed the fishway in 1949 eliminating adult salmonid passage until the dam was removed in 1963. Adult Pacific lamprey passage may have occurred during this entire period as adult Pacific lamprey have the ability to climb above water surface levels (G. Starke, U.S. Army Corps of Engineers, personal communications). Pacific lamprey returns following removal of the dam have potentially provided recolonization stock for the S.F. Clearwater River drainage.

The land ownership of the Clearwater River basin is U. S. Forest Service, Bureau of Land Management, and other federal Lands (58.0%), State of Idaho (6.0%), Timber Company Land (8.0%), Nez Perce Tribe (4.0%), and Private (24.0%). Land use in the Clearwater River drainage is primarily agricultural or livestock pasture grazing in the lower and central basin and forestry related in the headwater reaches. Dredge mining predominantly occurred in the S.F. Clearwater River drainage.

The S.F. Clearwater River drains 300,440 hectares. The upper S.F. Clearwater River watershed has several large meadow complexes with low stream gradients and fine substrates. The mid and lower S.F. Clearwater River reaches are predominantly canyon confined and boulder substrate dominated. The current land ownership of the S.F. Clearwater River watershed is federal (70%), private (28%), Nez Perce Tribe (0.9%), and State of Idaho (0.7%). Extensive mining from the 1860's to the mid-1900's occurred in four S.F. Clearwater River tributaries, Crooked River, Red River, American River, and Newsome Creek.

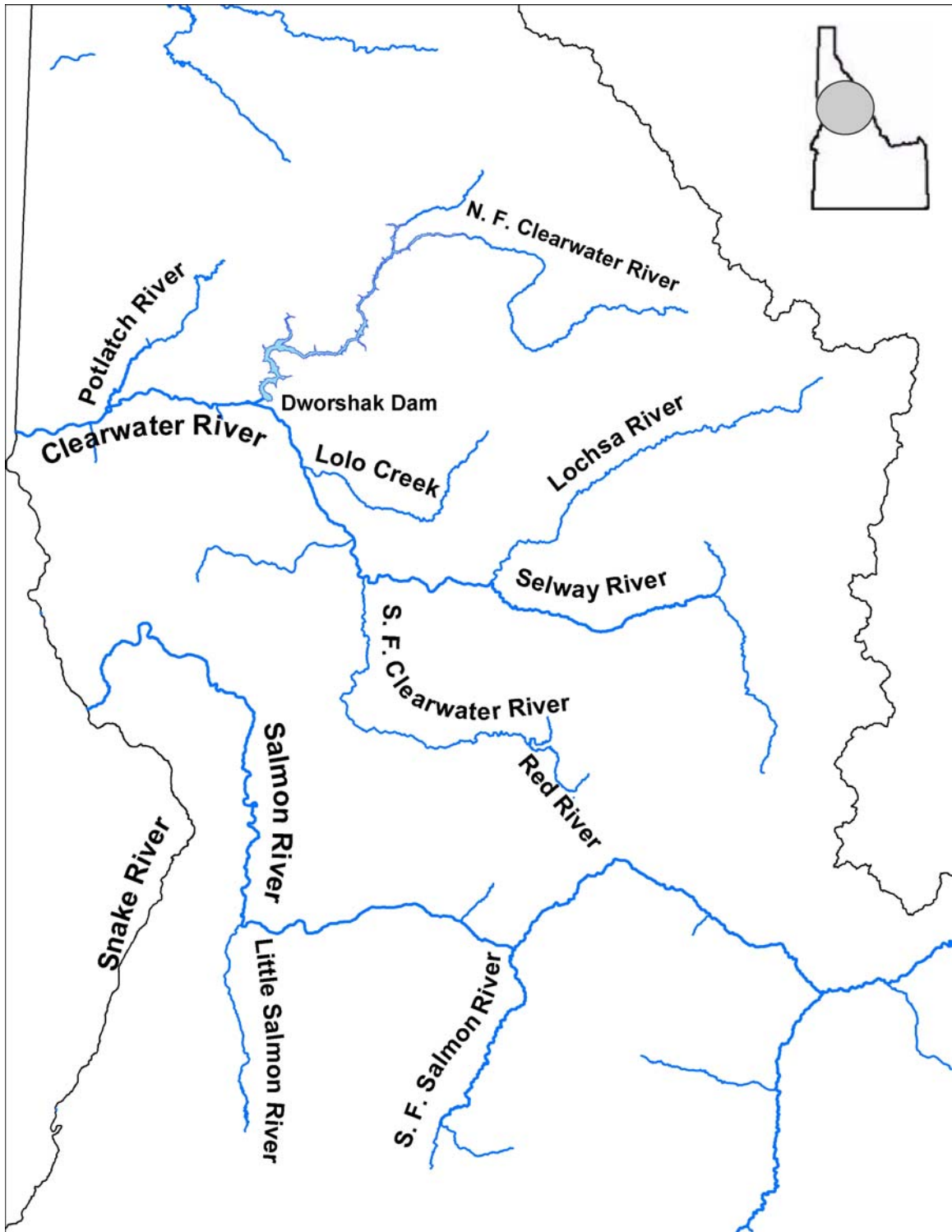


Figure 1. General location of Pacific lamprey studies in Idaho, 2003.

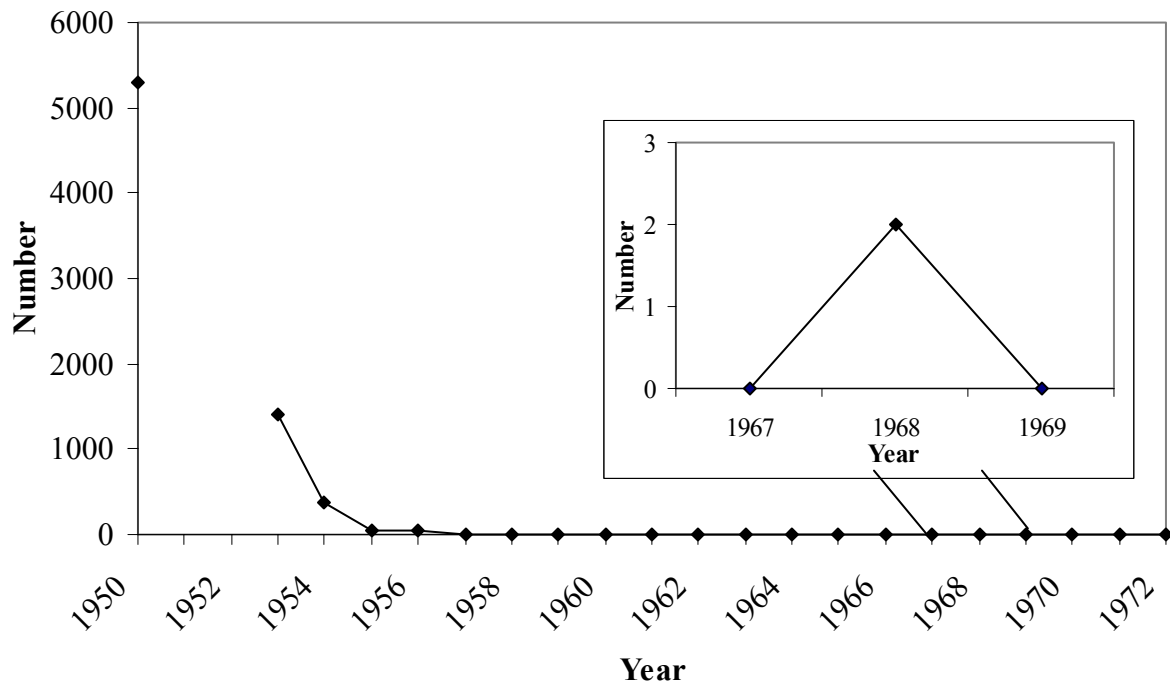


Figure 2. Pacific lamprey adult upstream passage, Lewiston Dam 1950-1972, Clearwater River drainage, ID.

## OBJECTIVES

- Objective 1. Determine life history characteristics of Pacific lamprey ammocoetes and macrothemia in the S.F. Clearwater River drainage.
- Objective 2. Determine habitat requirements of Pacific lamprey throughout the Clearwater River drainage.
- Objective 3. Determine distribution of Pacific lamprey in Clearwater River drainage.
- Objective 4. Determine feasibility of enhancing population in Clearwater River drainage.

## METHODS

Electroshocking techniques with an ABP-2 electrofisher were used to capture fish in stream channels. Presence-absence surveys were completed in the Red River, S.F. Clearwater River, Selway River, Lochsa River, Potlatch River, M.F. of the Clearwater River, lower Salmon River, and their selected tributaries (Figure 1). Presence-absence sampling was initially conducted in the S.F. Clearwater River drainage in 2001. Presence-absence sampling was implemented in the M.F. Clearwater River, Lochsa River, Potlatch River, and Selway River subbasins in 2002 and 2003. Sites were selected based on previous work identifying suitable Pacific lamprey stream habitat characteristics (Table 1). In 2003 extended surveys were utilized to identify Pacific lamprey distribution in tributaries and reaches of the Lochsa river, Selway River, M.F. Clearwater River, and tributaries not sampled in 2002.

Determination of habitat usage was focused in the Red River drainage. We segmented Red River into one-kilometer sections from its mouth upstream to the uppermost bridge crossing (rkm 41). We prioritized Red River habitat sampling locations based on random selection of kilometer section and then sampled the first 100 meters of each selected section. The habitat in each of the sampled sections was classified as to type (Table 1). The first riffle, pool, glide, etc., was electroshocked from its downstream boundary upstream without repeating sampling in identical habitat types. Water depth, water velocity, substrate composition, and canopy cover were measured and recorded at the site of individual captures. Habitat classification and stream substrate assessment methodologies utilized in habitat utilization surveys were implemented in the 2001-2003 Clearwater River drainage presence-absence surveys.

Three downstream migrant traps currently operated by Idaho Department of Fish and Game in the S.F. Clearwater River drainage were used to monitor Pacific lamprey downstream movements. The Crooked River scoop trap (rkm 1.0) was replaced with a 1.50 m rotary screen trap in 2002. It was operated from April 4 to October 31 in 2003. A 1.50 m diameter rotary screen trap on American River (rkm 3.0) was operated from April 12 to October 31. Another 1.50 m diameter rotary screen trap on Red River (rkm 5.0) was operated from April 10 to October 31. Nez Perce Tribal Fisheries (NPTF) operates a 1.50 m rotary screen trap at rkm 21.0 on Lolo Creek and another at rkm 0.1 on Newsome Creek. The Lolo Creek trap is operated 12 months annually, weather permitting. The duration of Newsome Creek trap operations is predominantly in the March to October period annually. Trapping records for the 1994-2003 period were obtained from Nez Perce Tribe biologists (Sprague and Johnson, NPTF 2003) and assessed to determine ammocoete and macrothemia downstream migrant magnitude and timing in the Lolo and Newsome Creek drainages.

With the exception of fish captured in rotary screen or scoop traps, all captured Pacific lamprey ammocoetes and macrothemia were anesthetized, and total lengths and body weights measured. Individuals were then recovered in fresh water and released near the site of capture. Outmigrant estimates at traps were made using trap area-fished methods (Beamish and Levings 1991).

Pacific lamprey ammocoete and macrothemia collection and passage information at Lower Granite Dam was obtained from the Washington Department of Fish and Wildlife personnel to determine the magnitude and timing of Pacific lamprey downstream migration. Mortality samples of macrothemia and ammocoetes were collected to obtain genetic material and assess the general size of ammocoetes and macrothemia captured.

Table 1. Habitat unit and substrate classification for sampling sites in the Clearwater River and Salmon River drainages, ID, 2000-2003.

Habitat Units	I.D.	Substrate Classification	
Falls	FLL	Substrate Type (mm)	
		Large Boulder	> 512
Cascades	CAS	Small Boulder	256-512
		Cobble	64-256
Rapids		Coarse Gravel	16-64
Typical	RTT	Medium Gravel	8-16
Boulders	RBB	Fine Gravel	2-8
Bedrock	RBD	Course Sand	0.5-2
		Fine Sand	0.062-0.50
Riffles		Silt/Organic	0.004-0.062
Typical	RIF		
Pocket-water	RIP		
Glide	GLD		
Pools			
Lateral Scour Pool	LSP		
Straight Scour Pool	SCP		
Plunge Pool	PPP		
Dammed Pool	DMP		
Alcove	ALC		

Development of a management plan to maintain or enhance existing Pacific lamprey population will be focused on translocation of pre-spawn adults from downstream Columbia River locations and supplementation with hatchery spawned ammocoetes into suitable habitat. As part of determining if these actions are feasible, disease and genetic concerns were addressed.

## RESULTS

As in 2000-2002, no Pacific lamprey ammocoetes or macrothemia were captured in the Crooked River or American River rotary screen traps in 2003. Ten ammocoetes and one macrothemia were captured in the Red River rotary screen trap, but no length or weight measurements were obtained. Based on trap-area fished, a total of 70 ammocoetes and seven macrothemia were estimated to have migrated past the Red River trap in 2003.

Pacific lamprey distribution in the Clearwater River drainage was limited to lower 7.5 km of Red River, the S.F. Clearwater River, Selway River (Selway Lodge to mouth), Lochsa River (Ginger Creek to mouth), M.F. Clearwater River, and the Clearwater River (Figure 3). No Pacific lamprey were captured in the Selway River above Selway Lodge, Selway River tributaries, Lochsa River tributaries, M.F. Clearwater River tributaries, or Potlatch River.

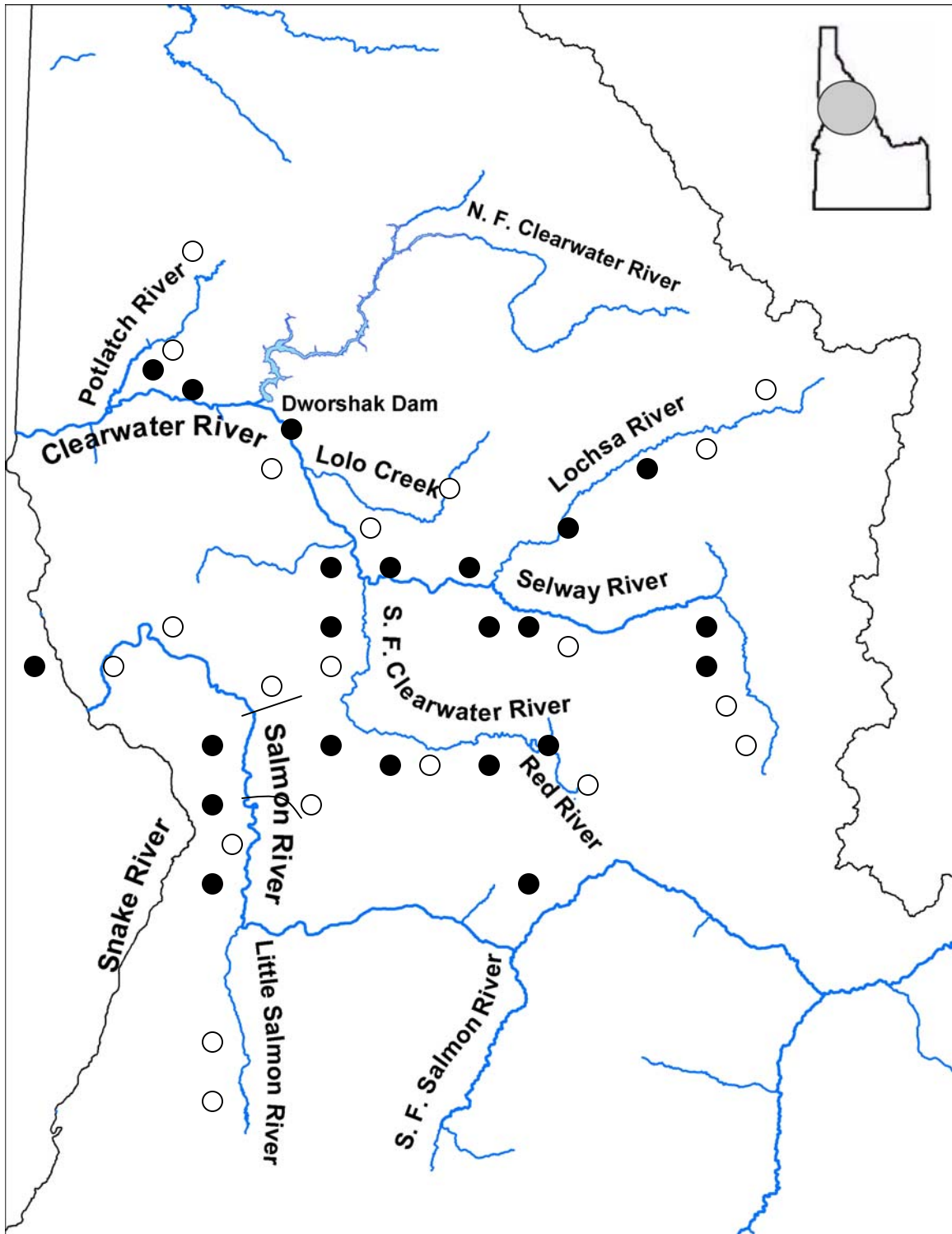


Figure 3. Location of Pacific lamprey investigations in the Clearwater River drainage, ID, 2000-2003. Circles indicate general sample locations with closed circles indicating sites of Pacific lamprey ammocoete observations.

A total of 65 Pacific lamprey ammocoetes were captured by electroshocking in Red River (Table 2). Pacific lamprey ammocoetes were found in seven sections of Red River from the mouth upstream to rkm 7.5. No Pacific lamprey ammocoetes or macrothemia were captured in Red River sample sites above rkm 7.5. The largest Pacific lamprey ammocoete captured electroshocking in the Red River drainage in 2003 was 161 mm TL and the smallest measured 113 mm TL (Figure 4).

Individuals were mostly found inhabiting sand and silt substrates in calm water sites adjacent to overhanging riparian canopy cover or in low velocity pockets behind boulders. Pacific lamprey ammocoetes were captured in water depths ranging from 0.1 – 1.0 m, however, they were predominantly captured in depths <0.60 m.

No marked Pacific lamprey ammocoetes were recaptured in 2003 in Red River reaches with marked Pacific lamprey from previous years' surveys.

Ninety-eight Pacific lamprey ammocoetes were sampled in the S.F. Clearwater River in 2003 (Table 2). The largest ammocoete measured 155 mm TL while the smallest measured 95 mm TL (Figure 5). Sixty-eight ammocoetes were captured in the Selway River and 70 in the Lochsa River in 2003 (Table 2) (Figures 6 and 7). The largest ammocoete (161 mm TL) captured in the Clearwater River drainage in 2003 was captured in the Red River (Figure 4) and the smallest was captured in the Lochsa River (18 mm TL) (Figure 7).

Table 2. Presence-absence surveys of Pacific lamprey larvae in Red River, South Fork Clearwater River, Selway River, and Lochsa River, ID, 2003.

	Lamprey Captured	Total Area Fished m <sup>2</sup>	Total Time Fished (Min)	Lamprey/100 m <sup>2</sup>	C.P.U.E. (Lamprey/Min)
Red River	65	16.0	16.2	406.3	4.60
S.F. Clearwater River	98	15.0	13.6	653.3	7.20
Totals	163	31.0	28.8	--	--
2002-2003					
Selway River	68	22.0	19.2	309.0	3.05
Lochsa River (3 sites)	70	12	11.0	555.5	6.33
Totals	178	44.0	84.0	--	--



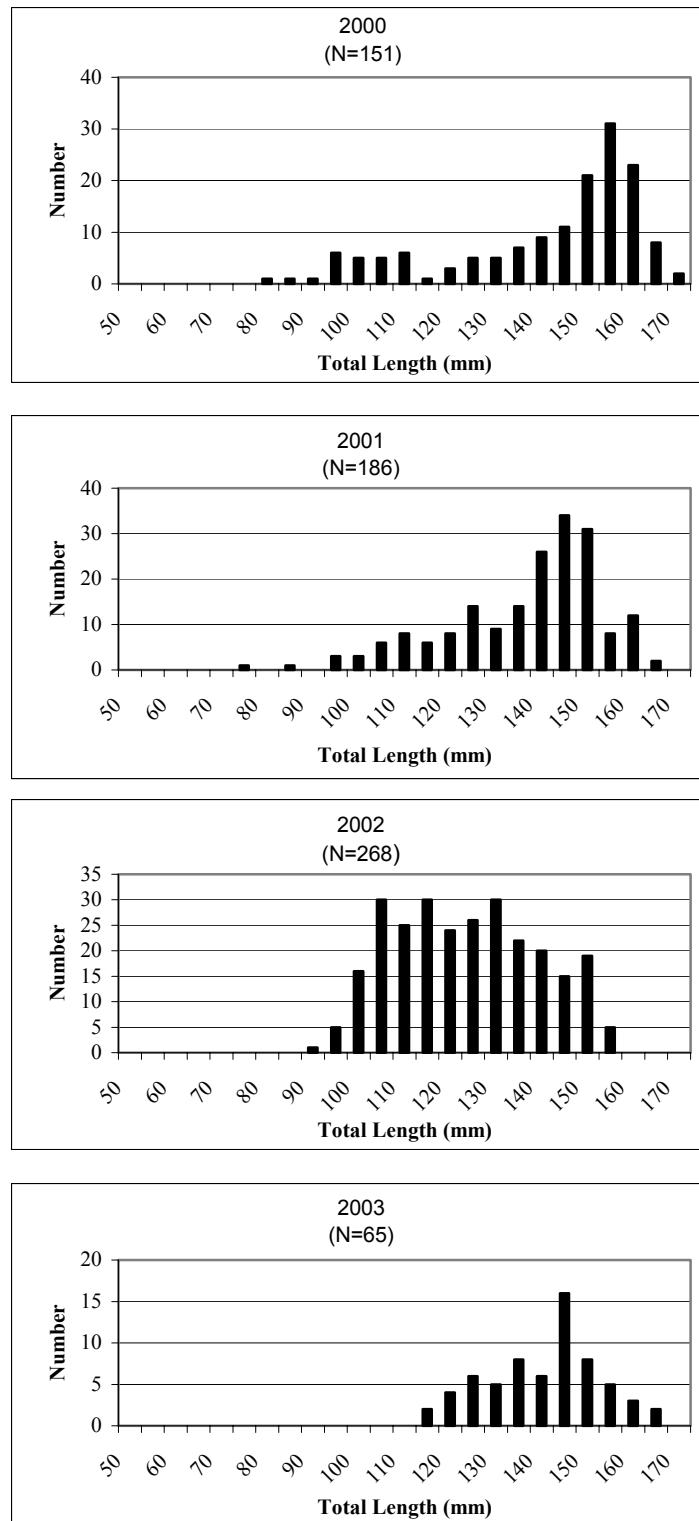


Figure 4. Length frequencies of Pacific lamprey ammocoetes captured by electroshocking in Red River, ID 2000-2003.

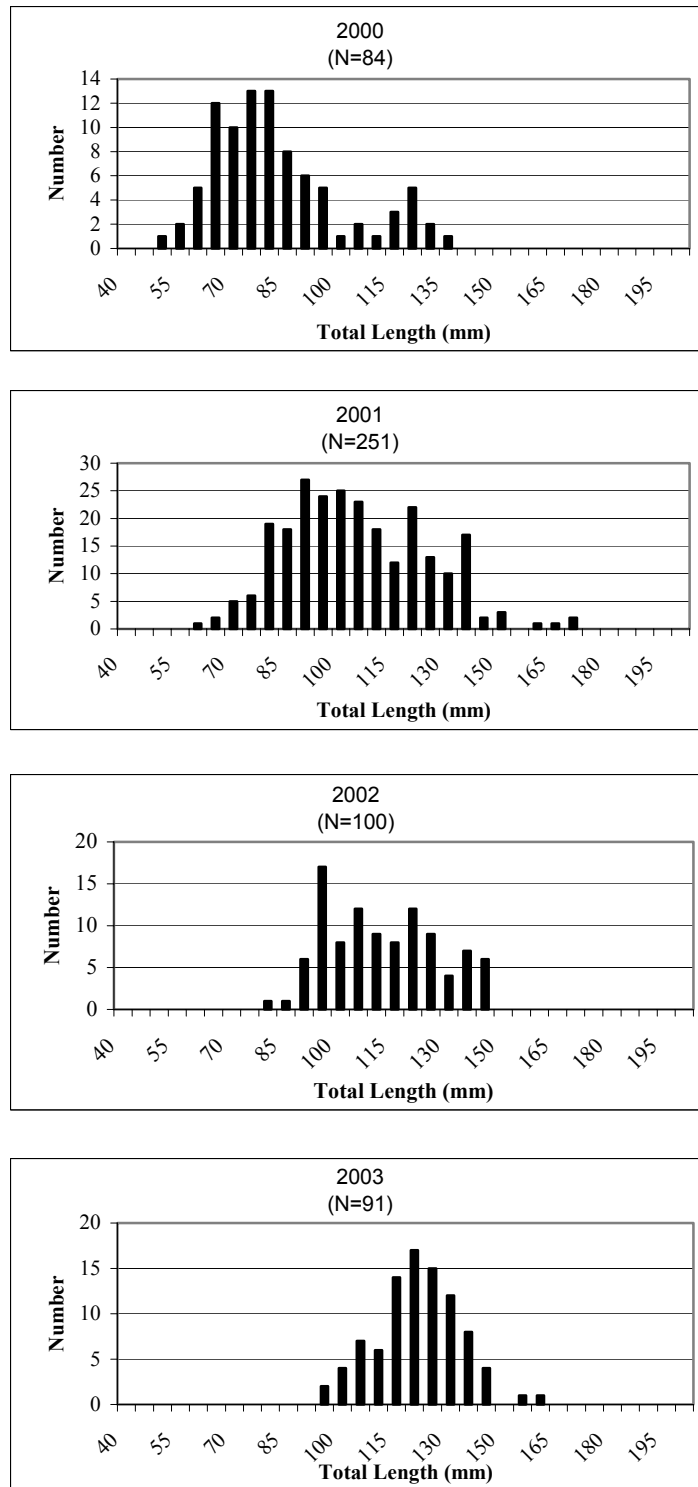


Figure 5. Length frequencies of Pacific lamprey captured by electroshocking in the S.F. Clearwater River, ID 2000-2003.

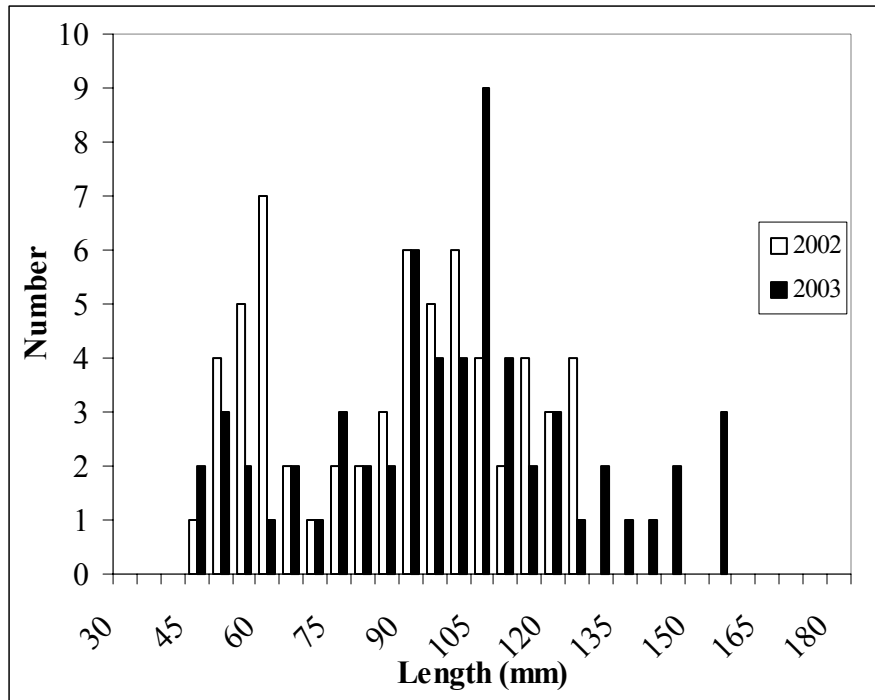


Figure 6. Total length frequency of Pacific lamprey ammocoetes (N=61, 2002; N=60, 2003) captured electroshocking in the Selway River, ID, 2002-2003.

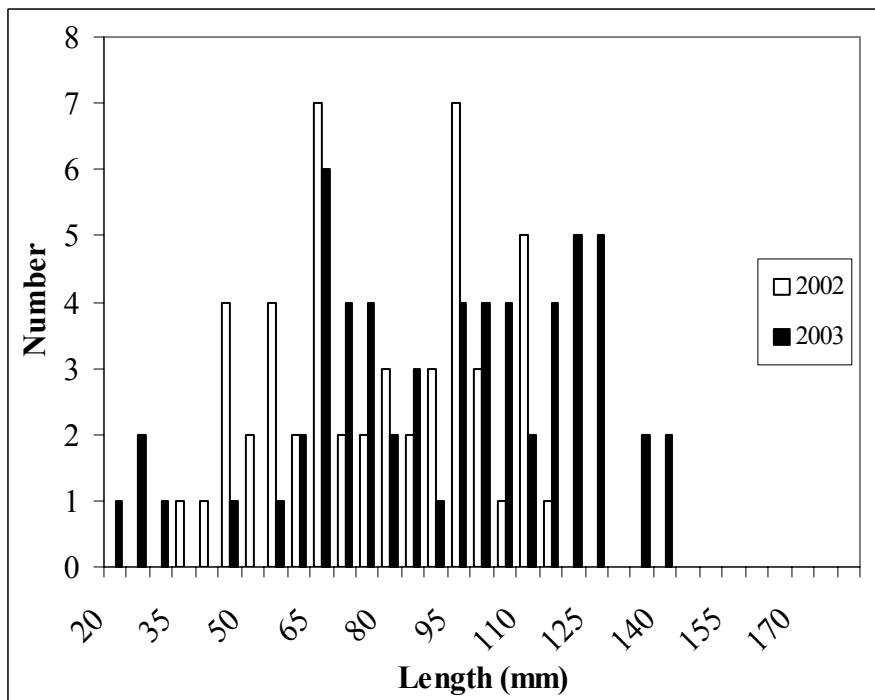


Figure 7. Total length frequency of Pacific lamprey ammocoetes (N= 50, 2002; N=60, 2003) captured electroshocking in the Lochsa River, ID, 2002-2003.

NPTF rotary screen trap (rkm 21.0) operations in the Lolo Creek drainage captured 496 Pacific lamprey ammocoetes and macrothemia 1994-2003 (Figure 8). Downstream movement of ammocoetes and macrothemia annually was similar in timing to Red River (54.2% Jan 1 to May 31), however, a greater proportion of Lolo Creek ammocoetes and macrothemia migrate downstream in the September – November period compared to Red River. The percentage of Pacific lamprey macrothemia captured in Lolo Creek rotary screen trap increased annually in the 1994-2001 period (Figure 9). Assessment of the average weights of length classes of Pacific lamprey ammocoetes captured in the Lolo Creek and Red River drainages suggests Lolo Creek ammocoete weights for a particular length class exceed those in Red River (Figure 10). Eight ammocoetes were captured in the Newsome Creek rotary screen trap (rkm 0.10) 1998-2003 with one ammocoete captured in 2002 and none in 2003.

A total of nine ammocoetes were captured in the Salmon River subbasin while sampling 17 locations in the mainstem and tributaries from three rkm's upstream of the South Fork Salmon River (rkm 217.2) downstream to the mouth. Lengths were not obtained for the majority of the ammocoetes captured, however, two ammocoetes less than 100 mm total length were captured in the mainstem downstream of the Little Salmon River confluence (rkm 133.9). No ammocoetes were captured or observed in selected tributaries, White Bird Creek, Eagle Creek, Slate Creek, Rapid River, Hazard Creek, Hard Creek, and Boulder Creek.

Pacific lamprey juvenile and larval passage information obtained from Washington Department of Fish and Wildlife at Lower Granite Dam in 1996-2003 supports information pertaining to spring chinook and steelhead trout and indicates that downstream movements of migrating ammocoetes and macrothemia are linked to increased springtime flows (Figure 11).

Information pertaining to Pacific lamprey disease issues is limited, however, some disease samples have been collected by the U.S. Fish and Wildlife Service (Lower Columbia River Fish Health Laboratory) in the 1990-2003 period. Samples currently processed indicate Pacific lamprey are capable of contracting furunculosis *Aeromonas salmonicida*. The U.S. Fish and Wildlife Service along with the University of California at Davis, the Hatfield Marine Science Center (Newport, OR), and the Nanaimo British Columbia laboratories were contacted in 2003 and their findings and biological opinions supported the U.S. Fish and Wildlife work.

In the event lamprey populations decline to the point reintroduction is necessary, the potential sources for Pacific lamprey adults to support adult translocation and hatchery supplementation programs will depend on the genetic compatibility of downstream sources in relation to existing Idaho's populations. Limited information is presently available regarding Pacific lamprey genetics. To address the questions of compatibility, this project will begin focusing on the genetics issues in 2004-2005.

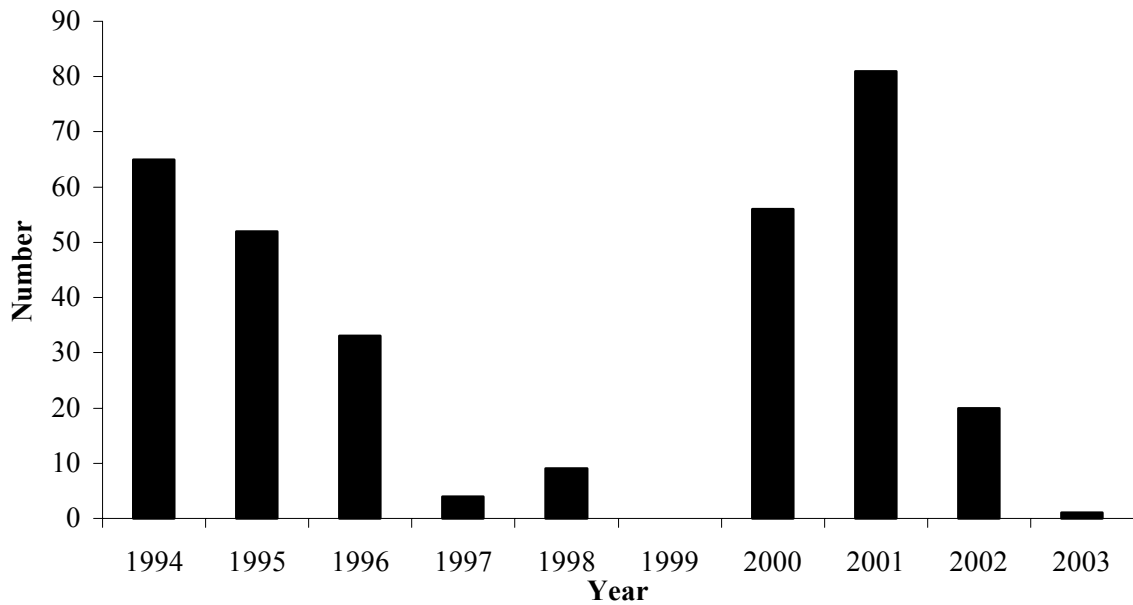


Figure 8. Pacific lamprey captured (N=496) in NPTF rotary screen trap Lolo Creek (rkm 21.0) 1994-2003, Clearwater River drainage, ID (Sprague and Johnson 2003).

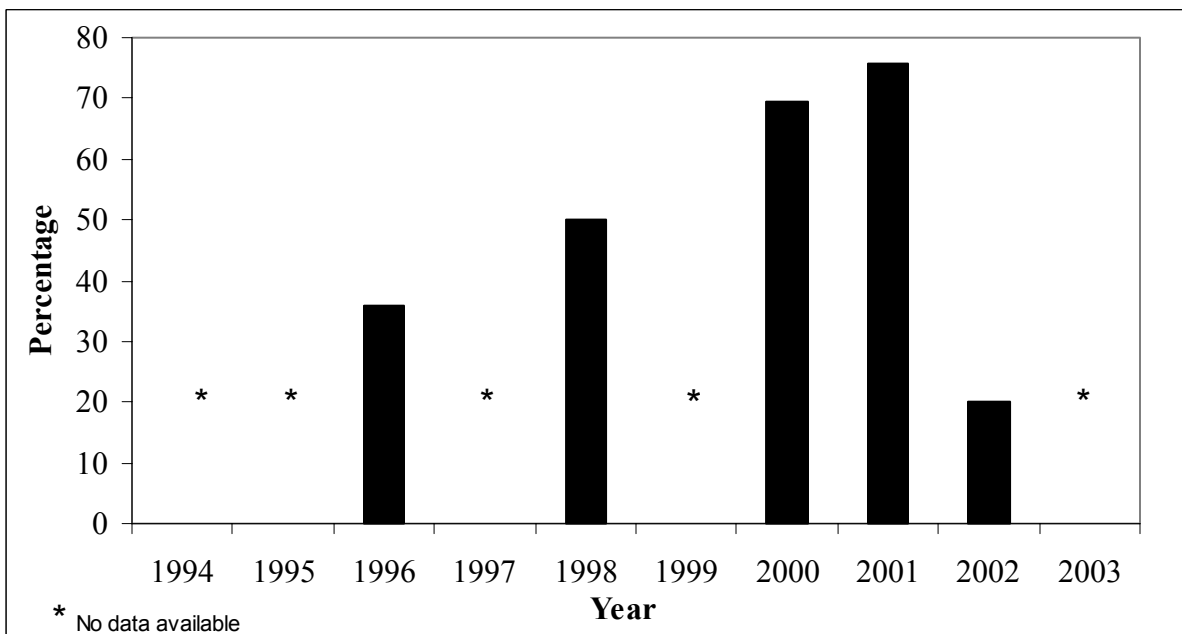


Figure 9. Pacific lamprey downstream migrant percentage transformed, NPTF rotary screen trap (rkm 21.0), 1994-2003, Clearwater River drainage, ID, (Sprague and Johnson 2003).

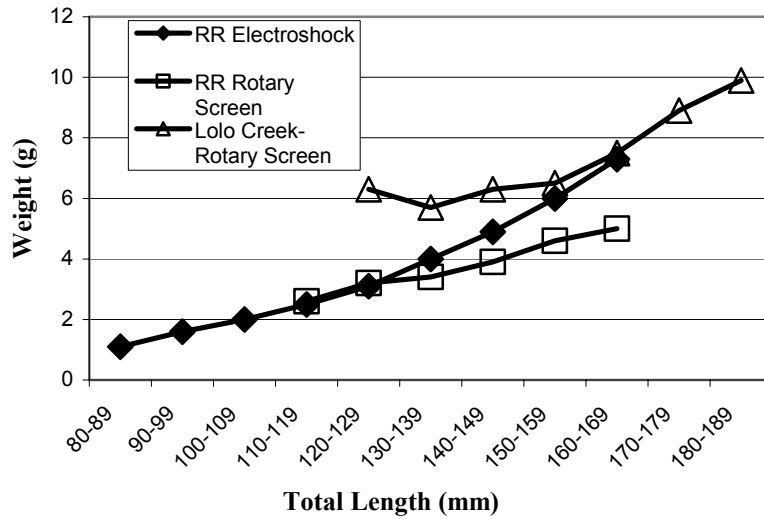


Figure 10. Pacific lamprey ammocoete and macrothalmia length grouping and average weight, Red River (RR) and Lolo Creek, Clearwater River drainage, ID, (Lolo Creek, Sprague and Johnson NPT 2003).

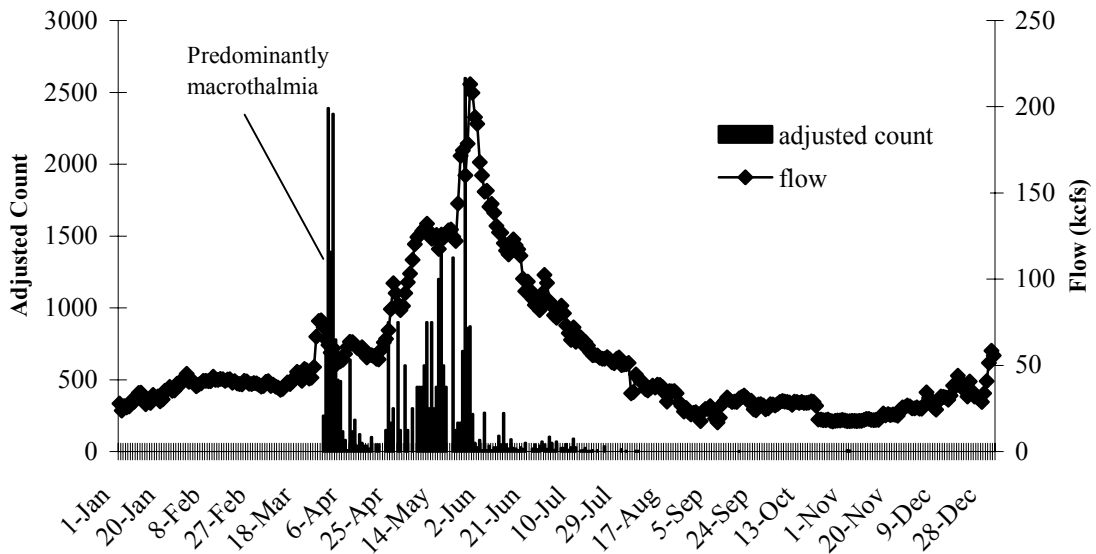


Figure 11. Pacific lamprey ammocoete and macrothalmia adjusted bypass/collection count and Snake River flows, Lower Granite Dam, WA, 1998.

## DISCUSSION

Presence-absence sampling in 2000-2003 in the S.F. Clearwater River basin firmly indicates distribution of Pacific lamprey in the basin is restricted to the mainstem S.F. Clearwater River and the lower Red River. Suitable habitat remains in the upper Red River, American River, and Crooked River, but Pacific lamprey ammocoetes and macrothalmia were not found. Despite presence-absence work in the Newsome Creek subbasin in 2001 no Pacific lamprey were captured, and NPTF rotary screen trapping clearly indicates remnants of Pacific lamprey populations in the stream are nearing the final stages of decline. Pacific lamprey ammocoete distribution in the Selway River and Lochsa River drainages was limited to mainstem reaches. Hammond (1979) captured Pacific lamprey ammocoetes in the mainstem Potlatch River upstream of Kendrick, ID, and the East Fork of the Potlatch River. In 2002 Pacific lamprey presence-absence sampling in mainstem Potlatch River, Bear Creek, and the East Fork Potlatch River failed to produce lamprey.

During 2000-2003, no Pacific lamprey ammocoetes or macrothalmia were captured in the Crooked River or American River rotary screen traps. In 2002 one-hundred twenty-five Pacific lamprey ammocoetes and 20 macrothalmia were captured in the Red River rotary screen trap compared to 10 ammocoetes and one macrothalmia in 2003. Based on trap-area fished, a total of 70 ammocoetes and seven macrothalmia were estimated to have migrated past the Red River trap in 2003, compared to 875 ammocoetes and 140 macrothalmia in 2002, 307 ammocoetes and seven macrothalmia in 2001, and 175 ammocoetes and 14 macrothalmia in 2000.

A total of 679 (154, 186, 274, and 65) Pacific lamprey ammocoetes was captured by electroshocking in Red River in 2000-2003. One macrothalmia was captured in Red River presence-absence surveys in September 2001. In 2000-2003 no Pacific lamprey ammocoetes or macrothalmia were captured in Red River sample sites at rkm's 8.0, 9.0, or 10.0, and locations sampled in upper Red River. The largest Pacific lamprey ammocoete captured electroshocking in the Red River drainage in 2000-2003 was 166 mm TL in 2000 and the smallest Pacific lamprey ammocoete captured measured 72 mm TL in 2001 (Figure 4).

The minimum length of ammocoetes in the S.F. Clearwater River increased incrementally comparing 2000 (47 mm TL), 2001 (60 mm TL), 2002 (77 mm TL), and 2003 (95 mm TL) (Figure 5). In 2001 the number of reaches surveyed was increased in order to determine the downstream distribution of Pacific lamprey thereby resulting in nearly 300% more ammocoetes sampled as compared to 2000 work. However, the minimum total length of ammocoetes increased. In 2002-2003 sampling was restricted to locations considered preferred. An increase in the minimum length ammocoete captured over the study period, 2000-2003, reflects a lack of recruitment in the S.F. Clearwater River subbasin.

More Pacific lamprey ammocoetes were captured in the Clearwater River drainage (random and nonrandom presence-absence surveys) sampling lateral scour pool habitat than any other single habitat type (Table 3), however, no alcove habitat was sampled in 2001, 2002, or 2003 where the greatest density of 253.3/100 m<sup>2</sup> was found in 2000. Individuals were mostly found inhabiting sand and silt substrates in calm water sites adjacent to overhanging riparian canopy cover or in low velocity pockets behind boulders.

Table 3. Habitat locations of Pacific lamprey larvae in randomly sampled units in Red River, ID, 2000-2002.

Habitat Type	Lamprey Captured	Total Area Fished m <sup>2</sup>	Total Time Fished (Min)	Lamprey/100m <sup>2</sup>	C.P.U.E. (Lamprey/Min)
Lateral Scour Pool	342	1283.4	1461	26.648	0.234
Riffle	15	603.5	726	2.486	0.021
Riffle with pockets (pocket water)	57	1269.8	825	4.489	0.069
Rapids with boulders	10	357.3	305	2.799	0.033
Alcove (non random)	19	7.5	20	253.333	0.950
TOTALS:	443	3521.5	3337	--	--

NPTF rotary screen trapping efforts in Lolo Creek suggest Pacific lamprey are currently present, however, the population composition of downstream migrant trapped Pacific lamprey indicates the percentage of macrothalmia increased consistently throughout the 1995-2001 period in the subbasin. Increasing macrothalmia percentages potentially reflect annual age incremental increase with limited recruitment. No Pacific lamprey were captured in 2003 with presence-absence sampling of 15 sites in Lolo Creek, Musselshell Creek, and Eldorado Creek. In 2003 NPTF captured one Pacific lamprey in the rotary screen trap at rkm 21.0.

Downstream migration of ammocoetes and macrothalmia in Red River occurs predominantly at night from mid-March to May 31, with a limited number captured in September and October (Figure 12). Out of the total (N=821) Pacific lamprey ammocoetes captured April 1 to October 31, 1993-2002 88% occurred between April 1 and May 31. In 1996 a total of 25 Pacific lamprey ammocoetes were captured in the March 13 to March 31 period, which is important information indicating an unknown portion of downstream migration occurs prior to the general April 1 – October 31 trapping period.



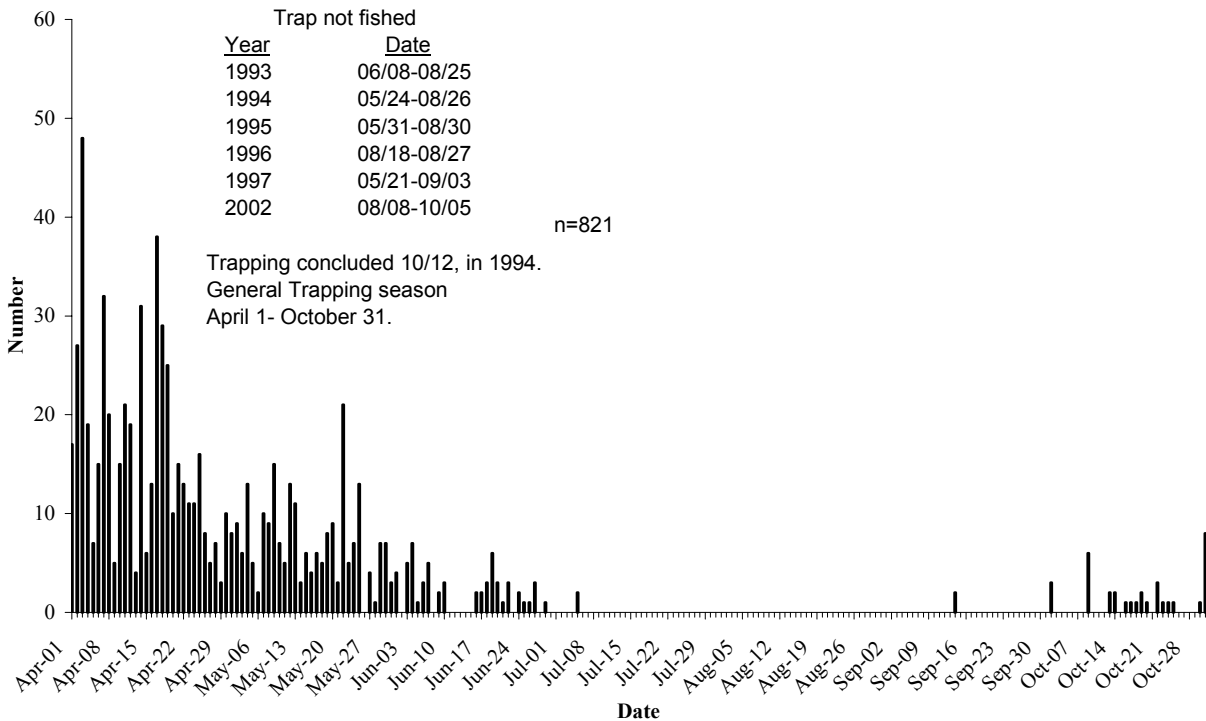


Figure 12. Pacific lamprey ammocoetes and macrothemia captured April 1-October 31, 1993-2002 in Red River trap (rkm 5.0), ID.

Adult Pacific lamprey passage over lower Columbia and Snake River dams show a downward trend in abundance (Figures 13, 14, and 15). Pacific lamprey densities observed in 2000-2003 reflect overall low population numbers in the Clearwater River drainage. The number of spawning adults in the Clearwater River basin is suspected to have averaged fewer than 200 Pacific lamprey annually 1995-2003. The Clearwater River drainage estimated spawning adult escapement is based on Lower Granite dam passage of an average of less than 600 adults in the 1998-2003 period and assumption of even distribution of Pacific lamprey adults into the Grande Ronde, Imnaha, Salmon, and Clearwater Rivers with fewer than one-third of Clearwater River drainage spawners returning to the S.F. Clearwater River.

Pacific lamprey adults often migrate upstream in the night hours. Nighttime counts were completed at Lower Granite Dam 1995-2002 (Figure 15) and are considered critically strategic in conjunction with daylight counts to determine abundance of Pacific lamprey adult escapement into the Snake River upstream of the project.

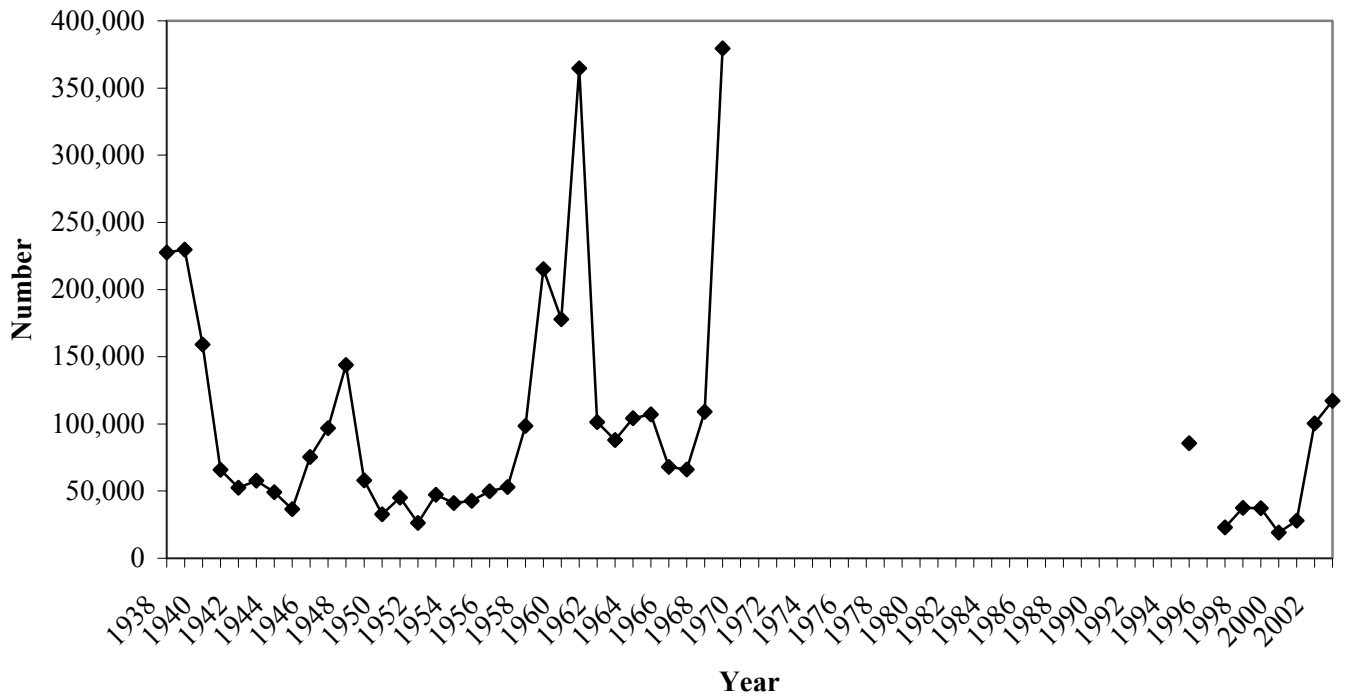


Figure 13. Pacific lamprey adult upstream passage 1938-2003, Bonneville Dam, OR.

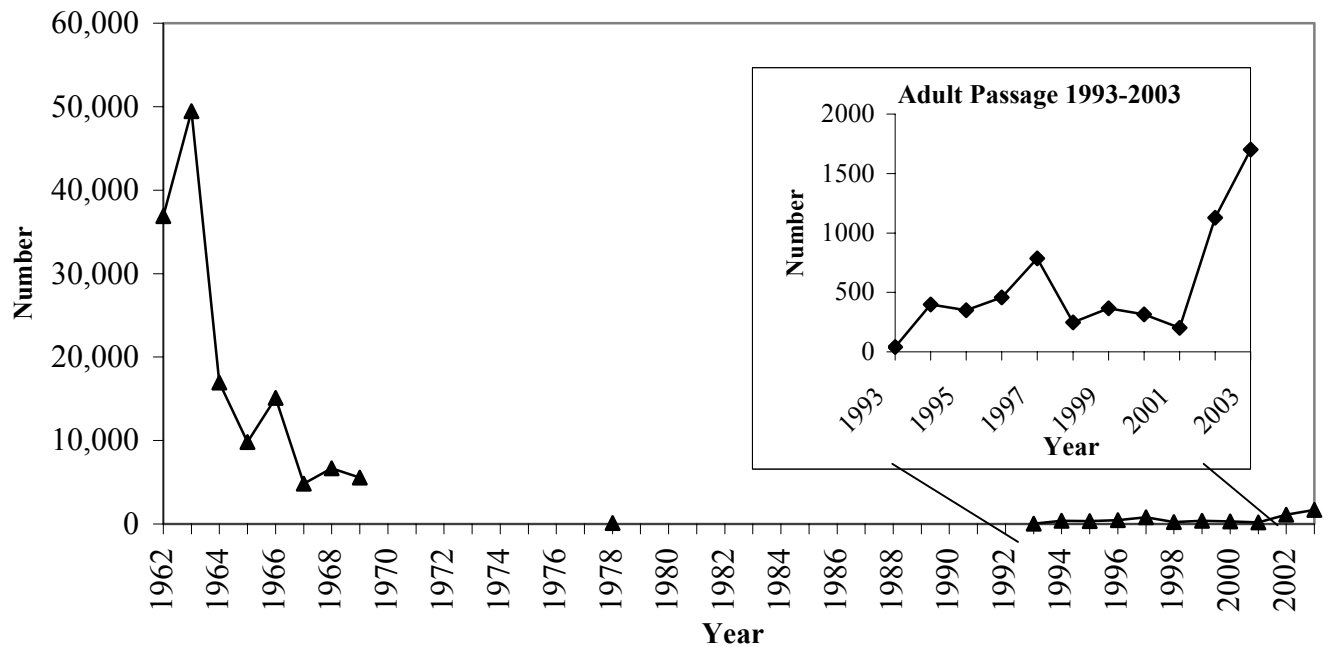


Figure 14. Pacific lamprey adult upstream passage 1962-2003, Ice Harbor Dam, WA.

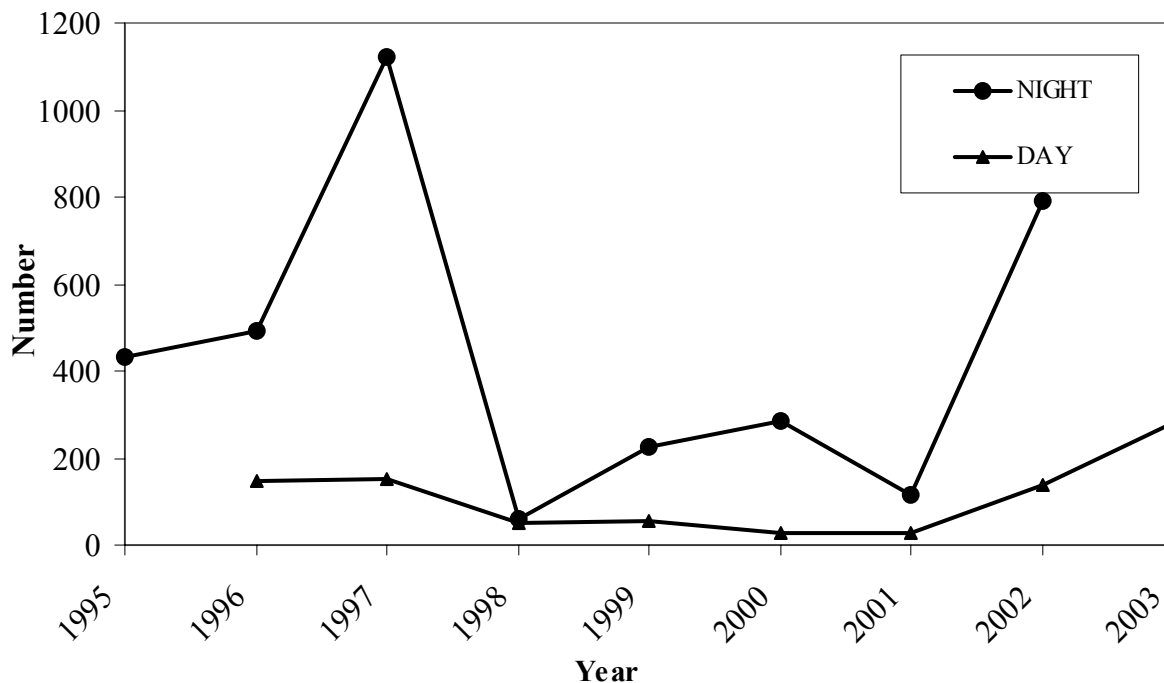


Figure 15. Pacific lamprey adult upstream passage (day and night) 1995-2003, Lower Granite Dam, WA.

Pacific lamprey persistence patterns in the Clearwater River drainage are, at best, difficult to analyze. Despite a severe declining trend in the Columbia River and Snake River basins (Figures 13, 14, and 15), Pacific lamprey remain in several Clearwater River drainage streams. The persistence of Pacific lamprey appears to be linked with high water quality in streams such as the Selway and Lochsa rivers (Dechert 2003, Gerhardt 1993). Streams with impaired water quality either do not support present populations as in Potlatch River or Lawyers Creek, or support declining populations such as found in the Lolo Creek and the S.F. Clearwater River drainage. However, excellent habitat quality cannot totally compensate for the limited numbers of lamprey passing Lower Granite Dam.

It is unknown if the populations of Pacific lamprey in the Clearwater River drainage are in the initial stages of approaching a critical unrecoverable threshold, however, of the 133 sites sampled in the Clearwater River basin in 2002-2003, only 18 produced Pacific lamprey. Throughout the Clearwater River drainage, the 2003 distribution is likely an estimated 40% of the drainage area occupied in 1960. Information of 2000-2003 reflects population minimal numbers and distribution ranges restricted to the remaining preferred habitat in the entire Clearwater.

Basic life history, distribution, and remaining population status are urgently needed to increase understanding of this species and to further implement intensive management before populations decline to critical, unrecoverable threshold in Idaho.

## **ACKNOWLEDGEMENTS**

This study was funded primarily by Bonneville Power Administration (Project Number 2000-028-00) with additional support from the Idaho Department of Fish and Game and the Bureau of Land Management.

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## **APPENDIX**



Appendix A. Table 1. Pacific lamprey length, weight, and mark information from Red River, ID, 2003.

Date	Km/	Habitat	Area	Time	Lamprey	Lamprey	Length	Weight	Mark <sup>1</sup>	Phase <sup>2</sup>
Electrofished	Reach	Type	Fished (m <sup>2</sup> )	Fished (Min.)	Captured	Measured	(mm)	(g)		
7/29/2003	06/03	LSP	5.0	na	10	10	142	unk	NO MARK	U
7/29/2003	06/03	LSP					147	unk	NO MARK	U
7/29/2003	06/03	LSP					144	unk	NO MARK	U
7/29/2003	06/03	LSP					161	unk	NO MARK	U
7/29/2003	06/03	LSP					151	unk	NO MARK	U
7/29/2003	06/03	LSP					142	unk	NO MARK	U
7/29/2003	06/03	LSP					154	unk	NO MARK	U
7/29/2003	06/03	LSP					149	unk	NO MARK	U
7/29/2003	06/03	LSP					148	unk	NO MARK	U
7/29/2003	06/03	LSP					133	unk	NO MARK	U
8/11/2003	06/00	GLD	5.0	5.5	24	24	144	3.8	NO MARK	U
8/11/2003	06/00	GLD					133	3.9	NO MARK	U
8/11/2003	06/00	GLD					132	3.4	NO MARK	U
8/11/2003	06/00	GLD					145	5.3	NO MARK	U
8/11/2003	06/00	GLD					143	4.7	NO MARK	U
8/11/2003	06/00	GLD					142	5.0	NO MARK	U
8/11/2003	06/00	GLD					152	4.8	NO MARK	U
8/11/2003	06/00	GLD					144	4.9	NO MARK	U
8/11/2003	06/00	GLD					142	4.5	NO MARK	U
8/11/2003	06/00	GLD					118	2.6	NO MARK	U
8/11/2003	06/00	GLD					133	3.4	NO MARK	U
8/11/2003	06/00	GLD					127	3.1	NO MARK	U
8/11/2003	06/00	GLD					134	3.9	NO MARK	U
8/11/2003	06/00	GLD					136	4.0	NO MARK	U
8/11/2003	06/00	GLD					150	5.1	NO MARK	U
8/11/2003	06/00	GLD					136	4.2	NO MARK	U
8/11/2003	06/00	GLD					143	4.5	NO MARK	U
8/11/2003	06/00	GLD					147	4.5	NO MARK	U
8/11/2003	06/00	GLD					154	5.6	NO MARK	U
8/11/2003	06/00	GLD					144	4.4	NO MARK	U
8/11/2003	06/00	GLD					132	3.7	NO MARK	U
8/11/2003	06/00	GLD					130	4.0	NO MARK	U
8/11/2003	06/00	GLD					147	5.3	NO MARK	U
8/11/2003	06/00	GLD					124	3.2	NO MARK	U
8/11/2003	07/00	RIP	1.0	2.0	1	1	155	unk	NO MARK	U
8/12/2003	07/08	LSP	5.0	8.7	30	30	142	4.3	NO MARK	U
8/12/2003	07/08	LSP					123	2.9	NO MARK	U
8/12/2003	07/08	LSP					143	4.7	NO MARK	U
8/12/2003	07/08	LSP					160	5.9	NO MARK	U
8/12/2003	07/08	LSP					156	5.8	NO MARK	U

Appendix A. Table 1. Continued.

Date	Km/ Reach	Habitat Type	Area	Time	Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
			Fished (m <sup>2</sup> )	Fished (Min.)						
8/12/2003	07/08	LSP					119	2.5	NO MARK	U
8/12/2003	07/08	LSP					130	3.1	NO MARK	U
8/12/2003	07/08	LSP					125	2.9	NO MARK	U
8/12/2003	07/08	LSP					138	3.7	NO MARK	U
8/12/2003	07/08	LSP					143	4.1	NO MARK	U
8/12/2003	07/08	LSP					126	3.4	NO MARK	U
8/12/2003	07/08	LSP					157	5.2	NO MARK	U
8/12/2003	07/08	LSP					142	4.3	NO MARK	U
8/12/2003	07/08	LSP					147	4.7	NO MARK	U
8/12/2003	07/08	LSP					122	2.8	NO MARK	U
8/12/2003	07/08	LSP					116	2.4	NO MARK	U
8/12/2003	07/08	LSP					132	3.5	NO MARK	U
8/12/2003	07/08	LSP					137	3.7	NO MARK	U
8/12/2003	07/08	LSP					121	2.9	NO MARK	U
8/12/2003	07/08	LSP					137	3.9	NO MARK	U
8/12/2003	07/08	LSP					148	4.7	NO MARK	U
8/12/2003	07/08	LSP					127	2.5	NO MARK	U
8/12/2003	07/08	LSP					161	6.5	NO MARK	U
8/12/2003	07/08	LSP					138	4.0	NO MARK	U
8/12/2003	07/08	LSP					132	3.4	NO MARK	U
8/12/2003	07/08	LSP					112	2.2	NO MARK	U
8/12/2003	07/08	LSP					122	2.7	NO MARK	U
8/12/2003	07/08	LSP					120	2.7	NO MARK	U
8/12/2003	07/08	LSP					113	2.2	NO MARK	U
8/12/2003	07/08	LSP					142	4.2	NO MARK	U

1. RCO-Right center orange

2. T-transformed; U-transformed

Appendix A. Table 2. Pacific lamprey length, weight, and mark information for S.F. Clearwater River, ID, 2003.

Date	Km/ Electrofished	Habitat Reach	Area		Time		Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
			Fished (m <sup>2</sup> )	Fished (Min)								
9/8/2003	49/na	LSP	5.0	4.3	23	23			135	4.2	NO MARK	U
9/8/2003	49/na	LSP							125	3.1	NO MARK	U
9/8/2003	49/na	LSP							140	4.1	NO MARK	U
9/8/2003	49/na	LSP							143	4.9	NO MARK	U
9/8/2003	49/na	LSP							125	3.2	NO MARK	U
9/8/2003	49/na	LSP							142	4.3	NO MARK	U
9/8/2003	49/na	LSP							130	3.4	NO MARK	U
9/8/2003	49/na	LSP							125	3.0	NO MARK	U
9/8/2003	49/na	LSP							158	6.5	NO MARK	U
9/8/2003	49/na	LSP							122	2.9	NO MARK	U
9/8/2003	49/na	LSP							125	3.3	NO MARK	U
9/8/2003	49/na	LSP							107	2.1	NO MARK	U
9/8/2003	49/na	LSP							111	2.2	NO MARK	U
9/8/2003	49/na	LSP							113	2.3	NO MARK	U
9/8/2003	49/na	LSP							105	1.6	NO MARK	U
9/8/2003	49/na	LSP							121	2.7	NO MARK	U
9/8/2003	49/na	LSP							133	3.5	NO MARK	U
9/8/2003	49/na	LSP							140	4.3	NO MARK	U
9/8/2003	49/na	LSP							122	2.7	NO MARK	U
9/8/2003	49/na	LSP							125	3.1	NO MARK	U
9/8/2003	49/na	LSP							153	5.4	NO MARK	U
9/8/2003	49/na	LSP							112	2.5	NO MARK	U
9/8/2003	49/na	LSP							127	3.3	NO MARK	U
9/8/2003	40/na	LSP	10.0	9.3	75	75			123	3.2	NO MARK	U
9/8/2003	40/na	LSP							114	2.4	NO MARK	U
9/8/2003	40/na	LSP							132	4.2	NO MARK	U
9/8/2003	40/na	LSP							120	2.8	NO MARK	U
9/8/2003	40/na	LSP							95	1.7	NO MARK	U
9/8/2003	40/na	LSP							117	2.7	NO MARK	U
9/8/2003	40/na	LSP							102	1.3	NO MARK	U
9/8/2003	40/na	LSP							116	2.6	NO MARK	U
9/8/2003	40/na	LSP							127	3.2	NO MARK	U
9/8/2003	40/na	LSP							118	2.6	NO MARK	U
9/8/2003	40/na	LSP							134	3.5	NO MARK	U
9/8/2003	40/na	LSP							132	3.6	NO MARK	U
9/8/2003	40/na	LSP							112	2.4	NO MARK	U
9/8/2003	40/na	LSP							102	1.7	NO MARK	U
9/8/2003	40/na	LSP							123	2.7	NO MARK	U
9/8/2003	40/na	LSP							117	2.8	NO MARK	U
9/8/2003	40/na	LSP							109	2.1	NO MARK	U
9/8/2003	40/na	LSP							114	2.4	NO MARK	U
9/8/2003	40/na	LSP							104	2.2	NO MARK	U
9/8/2003	40/na	LSP							95	1.6	NO MARK	U
9/8/2003	40/na	LSP							128	3.2	NO MARK	U
9/8/2003	40/na	LSP							110	1.9	NO MARK	U
9/8/2003	40/na	LSP							112	2.9	NO MARK	U

Appendix A. Table 2. Continued.

Date	Km/	Habitat	Area Fished	Time Fished	Lamprey Captured	Lamprey Measured	Length	Weight	Mark <sup>1</sup>	Phase <sup>2</sup>
Electrofished	Reach	Type	(m <sup>2</sup> )	(Min)			(mm)	(g)		
9/8/2003	40/na	LSP					102	1.9	NO MARK	U
9/8/2003	40/na	LSP					102	1.6	NO MARK	U
9/8/2003	40/na	LSP					123	3.0	NO MARK	U
9/8/2003	40/na	LSP					130	3.3	NO MARK	U
9/8/2003	40/na	LSP					100	1.5	NO MARK	U
9/8/2003	40/na	LSP					120	2.9	NO MARK	U
9/8/2003	40/na	LSP					120	2.5	NO MARK	U
9/8/2003	40/na	LSP					113	2.4	NO MARK	U
9/8/2003	40/na	LSP					109	2.4	NO MARK	U
9/8/2003	40/na	LSP					121	3.4	NO MARK	U
9/8/2003	40/na	LSP					118	2.5	NO MARK	U
9/8/2003	40/na	LSP					127	3.0	NO MARK	U
9/8/2003	40/na	LSP					117	2.6	NO MARK	U
9/8/2003	40/na	LSP					130	3.6	NO MARK	U
9/8/2003	40/na	LSP					118	2.7	NO MARK	U
9/8/2003	40/na	LSP					121	3.2	NO MARK	U
9/8/2003	40/na	LSP					115	2.5	NO MARK	U
9/8/2003	40/na	LSP					116	2.5	NO MARK	U
9/8/2003	40/na	LSP					119	2.8	NO MARK	U
9/8/2003	40/na	LSP					126	2.9	NO MARK	U
9/8/2003	40/na	LSP					141	4.2	NO MARK	U
9/8/2003	40/na	LSP					111	2.0	NO MARK	U
9/8/2003	40/na	LSP					98	1.7	NO MARK	U
9/8/2003	40/na	LSP					114	2.4	NO MARK	U
9/8/2003	40/na	LSP					144	4.7	NO MARK	U
9/8/2003	40/na	LSP					120	2.9	NO MARK	U
9/8/2003	40/na	LSP					130	3.5	NO MARK	U
9/8/2003	40/na	LSP					116	2.5	NO MARK	U
9/8/2003	40/na	LSP					122	2.9	NO MARK	U
9/8/2003	40/na	LSP					96	1.4	NO MARK	U
9/8/2003	40/na	LSP					128	3.2	NO MARK	U
9/8/2003	40/na	LSP					119	3.0	NO MARK	U
9/8/2003	40/na	LSP					127	33	NO MARK	U
9/8/2003	40/na	LSP					112	2.2	NO MARK	U
9/8/2003	40/na	LSP					109	1.4	NO MARK	U
9/8/2003	40/na	LSP					113	2.6	NO MARK	U
9/8/2003	40/na	LSP					119	2.7	NO MARK	U
9/8/2003	40/na	LSP					122	3.0	NO MARK	U
9/8/2003	40/na	LSP					120	3.0	NO MARK	U
9/8/2003	40/na	LSP					118	2.8	NO MARK	U

Appendix A. Table 2. Continued.

Area    Time										
Date	Km/	Habitat	Fished	Fished	Lamprey	Lamprey	Length	Weight		
Electrofished	Reach	Type	(m <sup>2</sup> )	(Min)	Captured	Measured	(mm)	(g)	Mark <sup>1</sup>	Phase <sup>2</sup>
9/8/2003	40/na	LSP					115	2.6	NO MARK	U
9/8/2003	40/na	LSP					119	2.7	NO MARK	U
9/8/2003	40/na	LSP					115	2.5	NO MARK	U
9/8/2003	40/na	LSP					121	unk	NO MARK	U
9/8/2003	40/na	LSP					139	4.2	NO MARK	U
9/8/2003	40/na	LSP					107	1.9	NO MARK	U
9/8/2003	40/na	LSP					130	3.5	NO MARK	U
9/8/2003	40/na	LSP					119	2.5	NO MARK	U
9/8/2003	40/na	LSP					121	2.5	NO MARK	U
9/8/2003	40/na	LSP					104	2.0	NO MARK	U
9/8/2003	40/na	LSP					96	1.4	NO MARK	U
9/8/2003	40/na	LSP					127	3.5	NO MARK	U

1 RCO-Right center orange

2 T-transformed; U-untransformed

Appendix A. Table 3. Pacific lamprey length, weight, and mark information for Selway River, ID, 2003.

Date	Km/ Reach	Habitat Type	Area	Time	Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
			Fished (m <sup>2</sup> )	Fished (Min.)						
7/25/2003	@ Selway Lodge	LSP	5.0	4.0	6	6	152	unk	NO MARK	U
7/25/2003	@ Selway Lodge	LSP					135	unk	NO MARK	U
7/25/2003	@ Selway Lodge	LSP					142	unk	NO MARK	U
7/25/2003	@ Selway Lodge	LSP					143	unk	NO MARK	U
7/25/2003	@ Selway Lodge	LSP					151	unk	NO MARK	U
7/25/2003	@ Selway Lodge	LSP					154	unk	NO MARK	U
7/26/2003	0.6km blw. Bear Crk.	LSP	2.0	na	7/23*	30	est. < 100	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. < 100	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. < 100	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. < 100	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. < 100	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. < 100	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. < 50	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est.< 50	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est.< 50	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est.< 50	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est.< 50	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est.< 50	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est.< 50	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est.< 50	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est.< 50	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
7/26/2003	0.6km blw. Bear Crk.	LSP					est. >25 <150	unk	unk	unk
9/7/2003	0.3km blw. Race Crk.	LSP	5.0	3.9	14	14	75	0.8	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					85	unk	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					85	0.8	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					47	unk	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					40	unk	NO MARK	U

Appendix A. Table 3. Continued.

Date	Km/	Habitat	Area	Time	Lamprey	Lamprey	Length	Weight	Mark <sup>1</sup>	Phase <sup>2</sup>
Electrofished	Reach	Type	Fished (m <sup>2</sup> )	Fished (Min.)	Captured	Measured	(mm)	(g)		
9/7/2003	0.3km blw. Race Crk.	LSP					62	0.4	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					49	unk	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					86	1.6	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					47	0.3	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					42	unk	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					51	0.4	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					72	0.9	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					86	1.2	NO MARK	U
9/7/2003	0.3km blw. Race Crk.	LSP					81	1.0	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP	5.0	5.7	15	15	58	0.2	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					126	2.5	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					79	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					108	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					106	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					130	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					60	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					100	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					100	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					95	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					104	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					94	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					122	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					68	unk	NO MARK	U
9/10/2003	150m blw. Gedney Crk.	LSP					71	unk	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP	5.0	5.6	26	25	87	1.1	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					111	1.8	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					119	2.5	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					88	1.4	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					92	1.4	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					104	2.0	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					101	1.5	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					104	2.0	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					118	2.5	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					104	1.9	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					114	2.5	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					109	unk	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					107	2.4	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					128	3.7	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					100	1.1	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					98	1.0	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					50	0.4	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					Lost <100	unk	NO MARK	U

Appendix A. Table 3. Continued.

Date	Km/	Habitat	Area		Time		Length	Weight		
			Fished	Fished	Lamprey	Lamprey				
Electrofished	Reach	Type	(m <sup>2</sup> )	(Min.)	Captured	Measured	(mm)	(g)	Mark <sup>1</sup>	Phase <sup>2</sup>
9/18/2003	Selway R. @ Johnson Bar	LSP					95	1.0	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					98	1.4	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					116	unk	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					94	unk	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					90	1.5	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					102	1.9	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					84	unk	NO MARK	U
9/18/2003	Selway R. @ Johnson Bar	LSP					72	unk	NO MARK	U

1 RCO-Right center orange

2 T-transformed; U-untransformed

\* Caught 7 lamprey, observed 23 additional lamprey, lengths were only estimated



Appendix A. Table 4. Pacific lamprey length, weight, and mark information for Lochsa River, ID, 2003.

Date	Km/ Electrofished Reach	Habitat Type	Area Time		Lamprey Captured	Lamprey Measured	Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
			Fished (m <sup>2</sup> )	Fished (Min.)						
8/8/2003	0.2km blw. Ginger. Crk.	LSP	5.0	5.5	10	10	est. >100	unk	unk	unk
8/8/2003	0.2km blw. Ginger. Crk.	LSP					est. >100	unk	unk	unk
8/8/2003	0.2km blw. Ginger. Crk.	LSP					est. >100	unk	unk	unk
8/8/2003	0.2km blw. Ginger. Crk.	LSP					est. >100	unk	unk	unk
8/8/2003	0.2km blw. Ginger. Crk.	LSP					est. >100	unk	unk	unk
8/8/2003	0.2km blw. Ginger. Crk.	LSP					est. >100	unk	unk	unk
8/8/2003	0.2km blw. Ginger. Crk.	LSP					est. >100	unk	unk	unk
8/8/2003	0.2km blw. Ginger. Crk.	LSP					est. >100	unk	unk	unk
8/8/2003	0.2km blw. Ginger. Crk.	LSP					est. >100	unk	unk	unk
8/8/2003	0.2km blw. Ginger. Crk.	LSP					est. >100	unk	unk	unk
9/5/2003	200m abv.Castle Crk.	LSP	5.0	5.5	28	28	25	< 0.10	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					25	< 0.10	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					122	2.7	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					136	4.0	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					121	2.5	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					92	1.3	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					131	3.5	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					100	1.8	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					116	2.5	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					121	2.4	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					117	2.6	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					120	2.5	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					100	1.7	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					118	2.6	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					122	2.9	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					131	3.6	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					102	1.7	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					115	2.4	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					93	1.5	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					112	2.2	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					104	1.9	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					112	2.1	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					136	3.7	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					98	1.7	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					66	0.5	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					123	2.7	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					112	2.2	NO MARK	U
9/5/2003	200m abv.Castle Crk.	LSP					95	1.4	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP	2.0	3.0	32	32	85	1.0	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					67	0.5	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					90	1.3	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					64	0.6	NO MARK	U

Appendix A. Table 4. Continued.

Date	Km/ Reach	Habitat Type	Area		Time		Length (mm)	Weight (g)	Mark <sup>1</sup>	Phase <sup>2</sup>
			Fished (m <sup>2</sup> )	Fished (Min.)	Lamprey Captured	Lamprey Measured				
9/6/2003	0.25 km blw.Fire Creek	LSP					77	0.7	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					56	0.4	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					67	0.4	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					62	0.6	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					55	0.4	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					71	0.8	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					62	0.7	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					62	0.5	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					61	0.5	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					105	1.7	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					69	0.8	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					57	0.4	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					84	1.1	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					110	2.1	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					65	0.5	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					45	0.3	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					18	<0.0	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					75	0.7	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					28	<0.1	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					72	0.7	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					120	2.6	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					110	2.2	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					84	0.7	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					103	1.5	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					78	0.9	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					75	0.7	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					94	1.2	NO MARK	U
9/6/2003	0.25 km blw.Fire Creek	LSP					98	1.3	NO MARK	U

1. RCO – Right center orange

2. T – Transformed; U - Untransformed

Appendix A. Table 5. Pacific lamprey presence-absence surveys in Red River, S.F. Clearwater River drainage, ID, 2003.

DATE	TIME	STREAM	RKM/DESCRIPT.	STREAM E.FISHED		TIME (min)	LAMPREY CAPTURED	DEPTH AVE.(m)	SHADE (%)
				AIR TEMP (°C) / TIME	TEMP (°C) / TIME				
7/29/2003	0900	Red R.	5.0/na	15.0 C/0900	17.5 C/0900	na	10	0.25	na
8/11/2003	0900	Red R.	6.0/na	16.0 C/0900	15.5 C/0900	5.5	24	0.20	na
8/11/2003	1200	Red R.	7.0/na	20.0 C/1200	17.5 C/1200	2.0	1	0.21	na
8/12/2003	0930	Red R.	7.080/na	15.0 C/0930	15.0 C/0930	8.7	30	0.20	na

Appendix A. Table 6. Pacific lamprey presence-absence survey habitat descriptors, Red River, S.F. Clearwater River drainage, ID, 2003.

STREAM	RKM/DESCRIPT.	E. FISHED AREA (m <sup>2</sup> )	DOMINANT SUBSTRATE PERCENTAGE						
			SILT/ORG.	SAND	GRVL.	COBBLE	SM. BLDR.	LG. BLDR.	OTHER
Red R.	5.0/na	5.0	25.0	35.0	2.0	2.0	17.0	14.0	5.0
Red R.	6.0/na	5.0	11.0	41.0	12.0	8.0	18.0	10.0	
Red R.	7.0/na	1.0		38.0	42.0	5.0		15.0	
Red R.	7.080/na	5.0	69.0	23.0		3.0			5.0

Appendix A. Table 7. Pacific lamprey presence-absence surveys in S.F. Clearwater River drainage, ID, 2003.

DATE	TIME	STREAM	RKM/DESCRIPT.	STREAM E.FISHED		TIME (min)	LAMPREY CAPTURED	DEPTH AVE.(m)	SHADE (%)
				AIR TEMP (°C) / TIME	TEMP (°C) / TIME				
9/8/2003	0956	S.F.Clrwtr	200m abv. Cougar Crk	12.0 C/0956	15.0 C/0956	4.3	23	0.33	na
9/8/2003	1356	S.F.Clrwtr	1.1km blw.Castle Crk	17.0 C/1356	16.0 C/1356	9.3	75	0.29	na

Appendix A. Table 8. Pacific lamprey presence-absence survey habitat descriptors, S.F. Clearwater River drainage, ID, 2003.

STREAM	RKM/DESCRIPT.	E. FISHED AREA (m <sup>2</sup> )	DOMINANT SUBSTRATE PERCENTAGE						
			SILT/ORG.	SAND	GRVL.	COBBLE	SM. BLDR.	LG. BLDR.	OTHER
S.F. CLWTR.	200m abv. Cougar Crk.	5.0	45.0	45.0	6.0	1.0		1.0	2.0
S.F. CLWTR.	1.1 km blw. Castle Crk.	10.0	22.0	15.0		7.0	35.0	16.0	5.0

Appendix A. Table 9. Pacific lamprey presence-absence surveys in Selway River drainage, ID, 2003.

DATE	TIME	STREAM	RKM/DESCRIPT.	AIR TEMP	STREAM	E. FISHED	LAMPREY CAPTURED	DEPTH AVE.(m)	SHADE (%)
				(°C) / TIME	TEMP (°C) / TIME	TIME (min)			
7/24/2003	0830	Selway R.	.6km abv. Shearer airstrip	20.0 C/0830	17.5 C/0830	4.0	0	0.26	na
7/24/2003	0930	Selway R.	2.5km abv. Shearer	16.5 C/0930	17.5 C/0930	3.5	0	0.22	na
7/24/2003	1130	Elk Crk.	80 m up frm mouth	21.0 C/1130	15.5 C/1130	2.0	0	0.15	na
7/25/2003	0900	Selway R.	@ Selway Lodge	21.0 C/0900	17.5 C/0900	4.0	0	0.25	na
7/25/2003	1045	Ditch Crk.	50 m frm mouth	24.0 C/1045	15.0 C/1045	3.0	0	0.22	na
7/25/2003	1300	Bear Crk.	50 m abv. Selway Trail	21.5 C/1300	17.5 C/1300	4.7	0	0.37	na
7/26/2003	0945	Selway R.	.6km blw. Bear Crk.	22.0 C/0945	19.0 C/0945	na	7/23**	0.40	na
9/07/2003	1035	Selway R.	.3km blw. Race Crk.	25.0 C/1035	17.0 C/1035	3.9	14*	0.15	na
9/10/2003	1205	Selway R.	150 m abv. Gedney Crk.	17.0 C/1205	15.0 C/1205	na	15*	0.27	na
9/18/2003	1120	Selway R.	100 m abv. Jnsn. Bar	17.0 C/1120	15.0 C/1120	5.6	26	0.16	na

\* 14/8 outside measured area, 15/6 outside measured area.  
 \*\* 7 captured, 23 observed (unmeasured)

Appendix A. Table 10. Pacific lamprey presence-absence survey habitat descriptors, in Selway River drainage, ID, 2003.

STREAM	RKM/DESCRIPT.	E. FISHED AREA (m <sup>2</sup> )	DOMINANT SUBSTRATE PERCENTAGE						
			SILT/ORG.	SAND	GRVL.	COBBLE	SM. BLDR.	LG. BLDR.	OTHER
Selway R.	.6km abv. Shearer airstrip	5.0	5.0	80.0	15.0				
Selway R.	2.5km abv. Shearer	5.0	5.0	57.0	33.0				5.0
Elk Crk.	80 m up frm mouth	1.0	1.0		54.0	15.0	10.0		20.0
Selway R.	@ Selway Lodge	5.0	14.0	70.0	8.0		8.0		
Ditch Crk.	50 m frm mouth	1.0	15.0	55.0	30.0				
Bear Crk.	50 m abv. Selway Trail	5.0		15.0	43.0	33.0		2.0	7.0
Selway R.	0.6km blw. Bear Crk.	2.0	13.0	35.0			22.0	30.0	
Selway R.	0.3km blw. Race Crk.	5.0	30.0	66.5		0.5	3.0		
Selway R.	150 m abv. Gedney Crk.	5.0	4.0	34.0	17.0	2.0	21.0	22.0	
Selway R.	100 m abv. Jnsn. Bar	5.0	22.0	10.0		15.0	26.0	25.0	2.0

Appendix A. Table 11. Pacific lamprey presence-absence surveys in Lochsa River drainage, ID, 2003.

DATE	TIME	STREAM	RKM/DESCRIPT.	AIR TEMP	STREAM	E.	LAMPREY	DEPTH	SHADE
				(°C) / TIME	TEMP	FISHED			
					(°C) / TIME	TIME	CAPTURED	AVE.(m)	(%)
8/7/2003	0930	Crooked Frk	Rd 595 Bridge Crossing	19.0 C/0930	11.0 C/0930	3.0	0	0.18	na
8/7/2003	1500	ColtKld. Crk	Under trail #50 bridge	22.5 C/1500	15.5 C/1500	3.0	0	0.40	na
8/8/2003	0830	Lochsa R.	0.2km blw. Ginger. Crk.	16.5C/0830	18.0 C/0830	5.5	10	0.20	na
8/9/2003	1300	Weir Creek	1.6km abv. mouth	21.0 C/1300	14.0 C/1300	2.5	0	0.20	na
9/4/2003	1028	Lochsa R.	50m blw. mi. 143	17.0 C/1028	15.0 C/1028	3.4	0	0.19	na
9/4/2003	1351	Lochsa R.	.7km blw.Weir Crk	20.0 C/1351	17.0 C/1351	2.3	0bs/40	est.<0.50	na
9/5/2003	0942	Lochsa R.	30.2km.abv. Bld. Mtn Crk.	21.0 C/0942	16.5 C/0921	5.5	28*	0.21	na
9/6/2003	0913	Lochsa R.	.25km blw. Fire Crk.	21.0 C/0913	18.0 C/0913	3.0	32*	0.22	na
							*28/8 outside measured area		
							*32/11 outside measured area		

Appendix A. Table 12. Pacific lamprey presence-absence survey habitat descriptors, in Lochsa River drainage, ID, 2003.

STREAM	RKM/DESCRIPT.	E. FISHED		DOMINANT SUBSTRATE					
		AREA	SILT/ORG.	PERCENTAGE			SM.	LG.	OTHER
		(m <sup>2</sup> )		SAND	GRVL.	COBBLE	BLDR.	BLDR.	
Crooked Frk	Rd 595 Bridge Crossing	5.0	7.0	55.0	27.0		8.0		3.0
ColtKld. Crk	Under trail #50 bridge	5.0		19.0	14.0	18.0	35.0	7.0	7.0
Lochsa R.	0.2km blw. Ginger. Crk.	5.0	5.0	15.0		20.0	45.0	13.0	2.0
Weir Creek	1.6km abv. mouth	1.0	15.0	60.0	20.0				5.0
Lochsa R.	50m blw. mi. 143	5.0	6.0	46.0	22.0		10.0	9.0	7.0
Lochsa R.	0.7km blw.Weir Crk	5.0	10.0	40.0		13.0	30.0	5.0	2.0
Lochsa R.	30.2km.abv. Bld. Mtn Crk	5.0	15.0	47.0	29.0		9.0		
Lochsa R.	0.25km blw. Fire Crk.	2.0	55.0	40.0			5.0		

Appendix A. Table 13. Pacific lamprey presence-absence surveys in Mainstem Clearwater River drainage, ID, 2003.

DATE	TIME	STREAM	RKM/DESCRIPT.	STREAM		TIME	E. FISHED		
				AIR TEMP	TEMP		LAMPREY	DEPTH	SHADE
				(°C) / TIME	(°C) / TIME	(Min)	CAPTURED	AVE.(m)	(%)
7/09/2003	1030	Lolo Crk	0.75 km blw.Yoosa Crk.	19.0 C/1030	12.0 C/1030	3.0	0	0.19	na
7/10/2003	1600	Lolo Crk	0.30 km abv. Yoosa Crk.	24.0 C/1600	17.0 C/1600	3.9	0	0.30	na
7/11/2003	0930	Lolo Crk	4 mi. abv. Musshl./Lolo Rd.	17.0 C/0930	13.0 C/0930	4.4	0	0.30	na
7/11/2003	1100	Lolo Crk	0.25 kmfrm. Rd. 103	19.0 C/1100	17.0 C/1100	4.7	0	1.39	na
7/12/2003	0930	Lolo Crk	0.30 km blw. Utah Crk.	21.0 C/0900	15.0 C/0900	3.8	0	0.20	na
7/12/2003	1100	Lolo Crk	30 m abv. Bradford Bridge	22.0 C/1100	17.0 C/1100	3.9	0	0.20	na
7/13/2003	0800	Musshl. Crk.	10 m blw.clvt. on Rd. 305	16.0 C/0800	15.0 C/0800	5.2	0	0.24	na
7/13/2003	0930	Musshl. Crk.	Lolo Crk Rd. Bridge	16.0 C/0930	16.5 C/0930	3.4	0	0.20	na
7/13/2003	1030	Musshl. Crk.	50 m abv. mouth	19.0 C/1030	17.5 C/1030	4.4	0	0.35	na
7/13/2003	1200	Eldorado Crk.	300 m abv.mouth	20.0 C/1200	13.0 C/1200	1.5	0	0.09	na
7/14/2003	0900	Lolo Crk	10 m blw. Brdg. Section 23	20.0 C/0900	15.0 C/0900	4.8	0	0.15	na
7/14/2003	1100	Lolo Crk	5.0 km blw. Lolo Cmpgrnd.	20.0 C/1100	15.5 C/1100	5.0	0	0.43	na
7/15/2003	1000	Lolo Crk	0.30 km blw. Lolo crk.rd brdg.	18.5 C/1000	17.5 C/1000	5.5	0	0.28	na
9/18/2003	1437	Mainstem Clrwtr.	100 m blw.3 Devils crk.	21.0 C/1437	14.5 C/1437	3.3	13*	0.17	na
9/19/2003	1416	Mainstem.Clrwtr.	5 mile Crk	22.5 C/1416	14.5 C/1416	4.3	21*	0.23	na
							*13/6 outside measured area, 21/9 outside measured area		

Appendix A. Table 14. Pacific lamprey presence-absence survey habitat descriptors, in Mainstem Clearwater River drainage, ID, 2003.

STREAM	RKM/DESCRIPT.	E. FISHED AREA (m <sup>2</sup> )	DOMINANT SUBSTRATE PERCENTAGE						
			SILT/ORG.	SAND	GRVL.	COBBLE	SM. BLDR.	LG. BLDR.	OTHER
Lolo Crk	0.75 km blw. Yoosa Crk.	5.0	8.0	70.0	20.0				2.0
Lolo Crk	0.30 km abv. Yoosa Crk.	5.0	70.0		26.0				4.0
Lolo Crk	4 mi. abv. Musshl./Lolo Rd.	4.5	10.0	57.0	16.0				17.0
Lolo Crk	0.25 km fr. Rd. 103	5.0	2.0	47.0	31.0	6.0	6.0	8.0	
Lolo Crk	0.30 km blw. Utah Crk.	5.0	18.0	69.0	13.0				
Lolo Crk	30 m abv. Bradford Bridge	5.0	72.0	12.0	9.0		3.0	2.0	2.0
Musselshell. Crk.	10 m blw. clvt. on Rd. 305	5.0	20.0	80.0					
Musselshell. Crk.	Lolo Crk Rd. Bridge	5.0		63.0	23.0		10.0		4.0
Musselshell. Crk.	50 m abv. mouth	5.0	10.0	30.0	34.0	3.0	8.0		15.0
Eldorado Crk.	300 m abv. mouth	1.0	47.0	33.0		15.0			5.0
Lolo Crk	10 m blw. Brdg. Section 23	5.0	10.0	25.0	16.0	45.0			4.0
Lolo Crk	5.0 km blw. Lolo Cmpgrnd.	2.0	80.0	15.0					5.0
Lolo Crk	0.30 km blw. Lolo crk. rd brdg.	5.0	3.0	38.0	54.0	5.0			
Mainstem. Clrwtr.	100 m blw. 3 Devils crk.	5.0	1.0	50.0	6.0	25.0	10.0	8.0	
Mainstem Clrwtr.	5 mile Crk	5.0	5.0	42.0	13.0	28.0	12.0		

Appendix A. Table 15. Pacific lamprey presence-absence surveys in Mainstem Salmon River drainage, ID, 2003.

DATE	TIME	STREAM	RKM/DESCRIPT.	STREAM E. FISHED		TIME (Min)	LAMPREY CAPTURED	DEPTH AVE.(m)	SHADE (%)
				AIR TEMP (°C) / TIME	TEMP (°C) / TIME				
9/09/2003	1222	Salmon R.	3.5km abv. Mackay. Bar	15.0 C/1222	17.0 C/1222	5.2	6	.23	na
9/21/2003	0910	S.F. Whtbrd.Crk.	40 m blw. Rd.642	8.0 C/0910	4.0 C/0910	3.9	0	.15	na
9/21/2003	1045	Ltl. Whtbrd.Crk.	10 m abv. rd 642 clvt.	9.0 C/1045	5.0 C/1045	4.6	0	.16	na
9/21/2003	1602	Whitebird Crk.	1.67km blw.. N. Fork	19.5 C/1602	13.0 C/1602	4.4	0	.35	na
9/22/2003	1029	Salmon R.	Hammer. Crk. Cmpgrnd.	16.0 C/1029	14.0 C/1029	3.5	1	.14	na
9/22/2003	1228	Salmon R.	Twin. Brdgs., 150 m abv.	23.0 C/1228	15.0 C/1228	2.9	1	.19	na
9/22/2003	1435	Salmon R.	300 m abv.Stlhd. Inn	23.0 C/1435	16.0 C/1435	2.9	0	.25	na
9/23/2003	0837	Salmon R.	Lucille Rec. Site	15.0 C/0837	13.0 C/0837	4.8	1	.25	na
9/23/2003	1000	Salmon R.	4.5km. blw. Riggins	14.0 C/1000	13.0 C/1000	3.4	0	.15	na
9/23/2003	1232	Slate Crk.	1.67km blw. L. Slate	14.0 C/1232	9.0 C/1232	6.3	0	.35	na
9/24/2003	0923	Slate Crk.	3.3km blw. N. Fork	11.0 C/0923	8.5 C/0923	4.6	0	.26	na
9/24/2003	1109	Slate Crk.	0.8 kmabv. Hurley Crk.	13.0 C/1109	9.0 C/1109	3.3	0	.23	na
10/4/2003	1040	Eagle Crk.	30.2km up frm mouth.	22.0 C/1040	12.5 C/1040	2.6	0	.17	na
10/4/2003	1315	Eagle Crk.	0.25km up frm mouth	28.0 C/1315	14.0 C/1315	5.2	0	.21	na
10/4/2003	1453	Salmon R.	1.67km blw. Eagle Crk.	30.0 C/1453	18.0 C/1453	3.8	0	.35	na
10/5/2003	1136	Salmon R.	0.3km blw.Wapshilla Crk.	17.0 C/1136	17.0 C/1136	4.3	0	.21	na
10/5/2003	0952	Salmon R.	0.3km abv. China Crk.	19.0 C/0952	17.0 C/0952	6.5	0	.40	na



Appendix A. Table 16. Pacific lamprey presence-absence survey habitat descriptors, in Mainstem Salmon River drainage, ID, 2003.

STREAM	RKM/DESCRIPT.	E. FISHED AREA (m <sup>2</sup> )	DOMINANT SUBSTRATE							
			SILT/ORG.	PERCENTAGE				SM. BLDR.	LG. BLDR.	OTHER
				SAND	GRVL.	COBBLE				
Salmon R.	3.5km abv. Mackay. Bar	5.0	14.0	8.0					1.0	
S.F. Whtbrd.Crk.	40 m blw. Rd.642	5.0	8.0	21.0	69.0	2.0				
Ltl. Whtbrd.Crk.	10 m abv. rd 642 clvt.	5.0	75.0	10.0	15.0					
Whitebird Crk.	1.67km blw.. N. Fork	5.0	22.0	2.0	18.0	43.0	15.0			
Salmon R.	Hammer. Crk. Cmpgrnd.	5.0	20.0	45.0		3.0	14.0	18.0		
Salmon R.	Twin. Brdgs., 150 m abv.	5.0	31.0	60.0	3.0	1.0	5.0			
Salmon R.	300 m abv.Stlhd. Inn	5.0	29.0	25.0		7.0	30.0	8.0	1.0	
Salmon R.	Lucille Rec. Site	5.0	10.0	57.0		7.0	10.0	16.0		
Salmon R.	4.5km. blw. Riggins	5.0		99.0		1.0				
Slate Crk..	1.67km blw. L. Slate	5.0	15.0	54.0	17.0	9.0	5.0			
Slate Crk..	3.3km blw. N. Fork	5.0	3.0	51.0	29.0	17.0				
Slate Crk..	0.8 kmabv. Hurley Crk.	5.0	26.0	51.0		2.0	5.0	15.0	1.0	
Eagle Crk.	30.2km up frm mouth.	5.0	7.0		17.0	39.0	19.0	18.0		
Eagle Crk.	0.25km up frm mouth	5.0	9.0	3.0	17.0	52.0	15.0	4.0		
Salmon R.	1.67km blw. Eagle Crk.	5.0	15.0	39.0	3.0	17.0	26.0			
Salmon R.	.3km blw.Wapshilla Crk.	5.0		94.0	5.5	0.5				
Salmon R.	.3km abv. China Crk.	5.0	2.0	70.0				28.0		

Appendix A. Table 17. Pacific lamprey presence-absence surveys in Little Salmon River drainage, ID, 2003.

DATE	TIME	STREAM	RKM/DESCRIPT.	STREAM		E. FISHED		LAMPREY CAPTURED	DEPTH AVE.(m)	SHADE (%)
				AIR TEMP (°C) / TIME	TEMP (°C) / TIME	TIME (Min)	TIME			
10/7/2003	1032	Bldr. Crk	2.5 km blw. Ant Basin Rd.	16.5 C/1032	7.0 C/1032	5.2		0	0.16	na
10/7/2003	1156	Bldr. Crk	5.0 km blw. Ant Basin Rd.	15.0 C/1156	8.0 C/1156	3.8		0	0.29	na
10/7/2003	1415	Bldr. Crk	.8 km blw. Lwr. Bldr.Crk Rd.	16.0 C/1415	9.0 C/1415	5.2		0	0.26	na
10/8/2003	0916	Hazard Crk.	20 m up from Hard Crk.	11.0 C/0916	9.0 C/0916	3.0		0	0.26	na
10/8/2003	1010	Hard Crk.	50 m abv. Mouth	13.0 C/1010	10.0 C/1010	4.8		0	0.29	na
10/8/2003	1412	Rapid R.	1.67 abv. R. R. Hatchery	22.0 C/1412	11.0 C/1412	3.3		0	0.21	na

Appendix A. Table 18. Pacific lamprey presence-absence survey habitat descriptors, in Little Salmon River drainage, ID, 2003.

STREAM	RKM/DESCRIPT.	E. FISHED		DOMINANT SUBSTRATE						
		AREA	SILT/ORG.	PERCENTAGE						
				SAND	GRVL.	COBBLE	BLDR.	BLDR.	OTHER	
Bldr. Crk	2.5km blw. Ant Basin Rd.	(m <sup>2</sup> )	5.0	55.0	6.0	34.0	5.0			
Bldr. Crk	5.0km blw. Ant Basin Rd.	5.0	43.0	20.0	26.0	11.0				
Bldr. Crk	0.8 kmblw.Lwr. Bldr. Crk Rd.	5.0	84.0	16.0						
Hazard Crk.	20 m up from Hard Crk.	3.0	3.5		5.5	19.0	37.0	35.0		
Hard Crk.	50m abv. Mouth	5.0			10.5	25.0	22.0	42.5		
Rapid R.	1.67 abv. R. R.Hatchery	6.0	5.0	26.0	37.0	8.0	7.0	17.0		